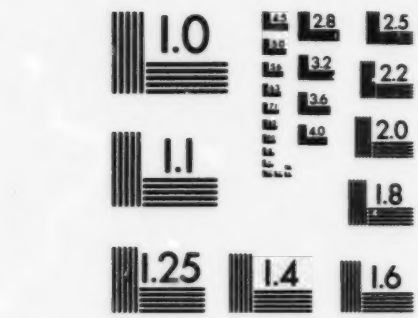
MS109

Micromedia Limited



MICROCOPY RESOLUTION TEST CHART
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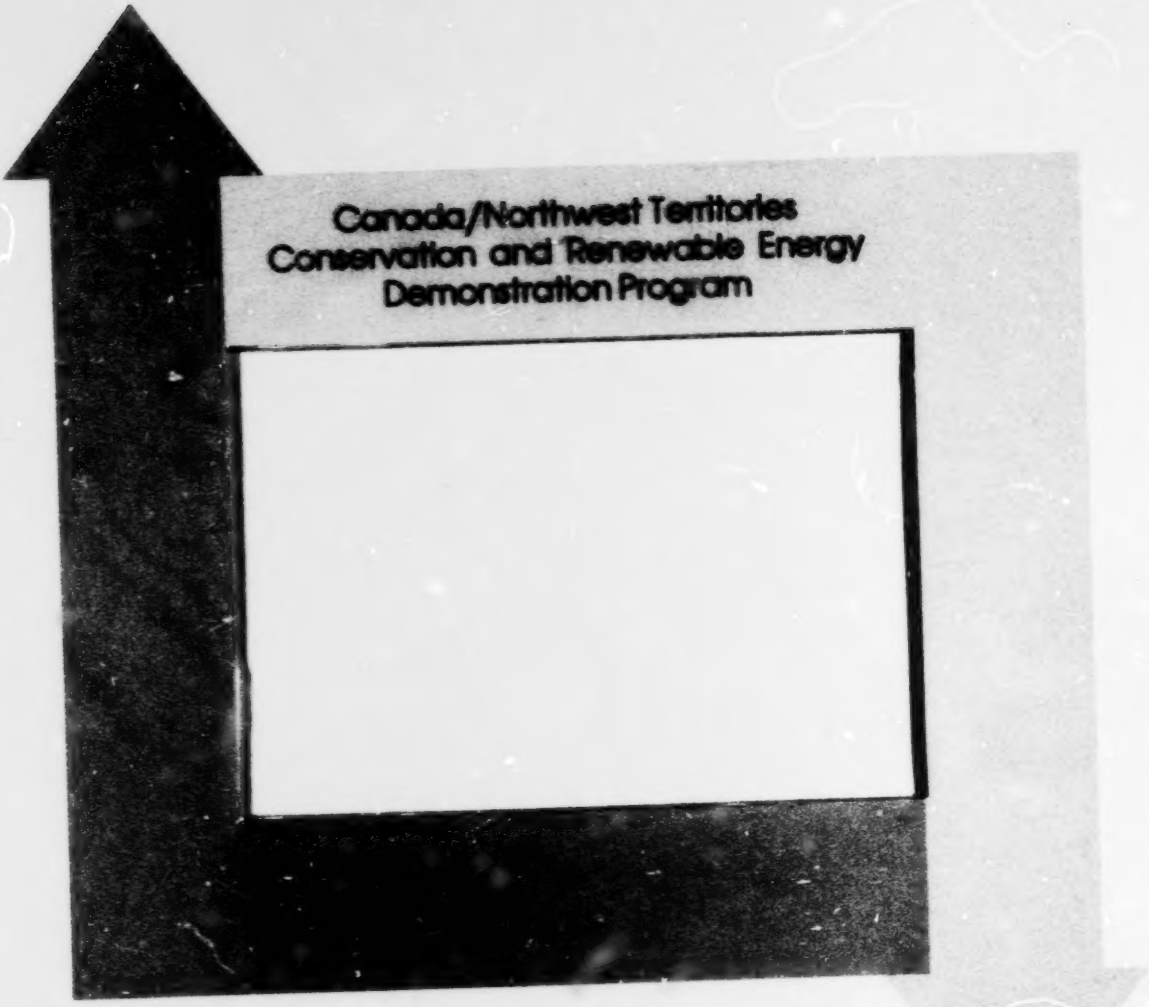

Energy, Mines and Resources Canada

Energie, Mines et Ressources Canada

Northwest Territories Public Works

MANECON PARTNERSHIP
MANAGEMENT & ECONOMIC CONSULTANTS

Energy, Mines and Resources Canada
&
Energy Conservation Division
Department of Public Works
Government of the Northwest Territories

ARCTIC HOTEL

RETROFIT and ADDITION

THIS PROJECT WAS CONVENED BY
CANADA/NORTHWEST TERRITORIES
CONSERVATION AND RENEWABLE ENERGY
DEMONSTRATION PROGRAM

MAY 1983

415, REVILLON BUILDING, 10201 - 104 STREET, EDMONTON, ALBERTA T5J 1B2
TELEPHONE: (403) 420-1527

CANADA/NWT CONSERVATION

AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

The availability of secure and affordable energy supplies is a subject of national concern. It is an accepted fact that our primary energy sources - oil and natural gas - are becoming less accessible and more costly. However, Canada is well endowed with non-renewable and alternative resources that can provide a bridge into the future.

To this end, the governments of N.W.T. and Canada have entered into a Conservation and Renewable Energy Demonstration Agreement which was signed March 24, 1980 and terminates March 31, 1984. The Agreement is dedicated to the development and demonstration of conservation and renewable energy technologies. Cost-shared by the territorial and federal governments, the program has a total budget of $3.3 million.

The objectives of CREDA are:

- To develop and demonstrate promising new technologies, which, when widely adopted, will exploit renewable resources, conserve energy and/or use energy more efficiently.
- To develop broad public awareness of the potential of renewable energy and conservation technology.
- To provide opportunities for the commercial application of the technologies.
- To create economic spin-off benefits for manufacturing, industry and commerce.
- To create employment in new or existing energy-related industries.

PROJECT SUMMARY

The Ikaluktutiak Cooperative Ltd. in Cambridge Bay received a capital grant of $12,000.00 from the Canada/NWT Conservation and Renewable Energy Demonstration Agreement program in 1982 to assist with the costs of upgrading the insulation and energy efficiency of an addition to their local hotel and a retrofit to the existing structure. The Co-op was also allocated an additional $10,000.00 by the CREDA program to carry out an information transfer program in conjunction with the project.

This report is prepared on behalf of the NWT CREDA office by Manecon Consulting Partnership and documents an assignment to assess the actual costs and benefits of the project, technical problems, operational experiences and the suitability of the concept for application in other cases.

The assignment was conducted by visiting the hotel in Cambridge Bay, examining the facility, and by discussing the project with local Co-op officials, the local retrofit contractor, the local mechanical contractor, and Arctic Cooperatives Ltd. management in Yellowknife.

The project has been an economic and technical success and the concepts demonstrated should be replicated in other northern building applications. The capital costs allocated to the enhanced energy measures totaled $35,169.00. This amount will be recovered from fuel cost savings in less than two years. The projected fuel savings, equal to 41% of the fuel needed without enhanced energy conserving measures, have been realized precisely as predicted.

Condensation problems have occurred in the attic space of the second storey addition due to inadequate design of the attic space ventilation. The problem is not attributable to the increased building insulation.

The concepts demonstrated by this project have been adopted in other ACL construction projects, and by some of the local building operators.

RÉSUMÉ DU PROJET

La Coopérative Ikaluktutiak Ltée. de Cambridge Bay recevait en 1982 une subvention de $12,000.00, de la part du programme conjoint du Canada et des T.N.O. de démonstration pratique de la conservation et du renouvellement de l'énergie (C.R.E.D.A.*), pour aider à défrayer les coûts du rehaussement de l'isolation et les frais encourus pour l'amélioration du rendement énergétique, dans une extension de leur hôtel local et dans un rétrofit de la structure existante. La Coopérative a aussi été accordée une somme de $10,000.00 par le programme de CREDA afin d'organiser la circulation de l'information conjointement avec le projet.

Ce rapport a été rédigé au nom du bureau de CREDA des T.N.O. par l'Association d'Ingénieurs-conseils Manecon (Manecon Consulting Partnership) et évalue les coûts réels et les avantages du projet, les problèmes techniques, les expériences pratiques et la praticabilité du concept pour son application en d'autres circonstances.

Cette tâche fut accomplie par un séjour à l'hôtel de Cambridge Bay afin d'inspecter l'immeuble, et par des discussions du projet avec les officiers locaux de la Coopérative, avec l'entrepreneur local du rétrofit, avec l'entrepreneur local en construction mécanique et avec la direction des Coopératives de l'Arctique Ltée. (Arctic Cooperatives Ltd.) à Yellowknife.

Le projet a été un succès économique et technique et les concepts démontrés devraient être reproduits dans d'autres projets de construction dans le Nord. Les

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*CREDA - Conservation & Renewable Energy Demonstration Agreement

frais de l'équipement et du matériel employés pour l'amélioration du rendement énergétique totalisent $35,169.00. Ce montant sera récupéré par les économies sur les coûts de l'huile à chauffage en moins de deux ans. La diminution projetée de la consommation de l'huile, qui atteint 41% du combustible nécessaire sans les mesures d'amélioration de la conservation de l'énergie, a été réalisée exactement telle que prévue.

Des problèmes de condensation se sont produits dans le grenier de l'extension de deux étages, par faute de l'aération imparfaite du grenier. Le problème n'est pas le résultat du rehaussement de l'isolation du bâtiment.

Les concepts démontrés par cette entreprise ont été adoptés dans d'autres projets de construction de "Les Coopératives de l'Arctique Ltée" et par d'autres entrepreneurs de construction locaux.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions reached as a result of this assignment, and recommendations to the NWT CREDA office and the project proponent, Ikaluktutiak Co-op Ltd., an affiliate of Arctic Cooperatives Ltd., are listed here. More detailed discussions of these points are found in subsequent sections.

Conclusions

1. The project has been an overall success in economic terms and technically as a demonstration of methods to utilize high levels of thermal insulation in new construction and in retrofit applications. The actual economic payback on capital investment is less than two years.

2. Some local interest in adopting the demonstrated concepts has been created. The Arctic Cooperatives Ltd., ACL, has adopted the techniques for other new building projects in the NWT.

3. The information transfer program to publicize the project, and gain maximum exposure for the demonstrated concepts has not been carried out, or at least has not received much effort.

4. The roof design for the hotel has not allowed for attic ventilation, and consequently attic frost build up and subsequent condensation damage to the ceiling has occured. The roof line vapour barrier does not form a complete seal to prevent moisture permeation into the attic space.

5. The air to air heat exchanger installed to provide for energy efficient ventilation of the second floor conference room (35' x 30' x 7') appears to be significantly undersized, and is therefore in-effective according to local Co-op management.

Recommendations

1. Modifications should be made to the roof of the hotel to improve attic ventilation and eliminate the condensation problem.

2. The waste heat available due to the operation of the adjoining bakery should be carefully assessed for possible productive use to heat portions of the hotel.

3. In future programs, CREDA should take the responsibility to develop a detailed and specific information transfer program to ensure their objectives are met for the maximum exposure of the project, its technology and the economic benefits possible.

4. A display model cross section of the building construction employed should be developed for use as a promotional aid and placed in prominent public locations.

5. The enhanced insulation concepts for new building construction and for retrofit to existing structures are recommended for use in all NWT buildings.

1.0 CONCLUSIONS ET RECOMMENDATIONS

Les conclusions atteintes, résultant de cette entreprise, et les recommendations faites au bureau de CREDA des T.N.O. et au participant du projet: la Coopérative Ikaluktutiak Ltée, une filiale de Les Coopératives de l'Arctique Ltée; sont inscrites ci-dessous. Dans les sections subséquentes se trouve une explication plus detaillée de chacun de ces points.

Conclusions

1. Le projet a été un succès total au plan économique et, techniquement, en tant que démonstration des méthodes de l'installation de l'isolant thermique à haut degré, dans des projet nouveaux de construction et dans les applications du rétrofit.

2. Une certaine mesure d'intérêt a été créée au niveau local dans l'adoption des concepts demontrés. Les Coopératives de l'Arctique Ltée ont adopté ces techniques pour d'autres projets de construction dans les T.N.O.

3. Le programme de circulation de l'information, pour publiciser le projet et obtenir l'exposition maximale pour les concepts demontrés, n'a pas été realisé, ou du moins, n'a pas reçu beaucoup d'èffort.

4. Le plan pour le toit de l'hôtel n'a pas permis l'aération du grenier et, conséquemment l'accumulation du givre dans le grenier et les condensations subséquentes ont endommagé le plafond. L'arrêt de condensation du toit ne forme pas un joint étanche suffisant pour prévenir la pénétration de l'humidité dans le grenier.

... 2

5. L'échangeur de chaleur d'air à air installé pour fournir une ventilation, à haut rendement énergétique, de la salle de conférence (35' X 30' X 7') du deuxième étage, semble être beaucoup trop petit et est de ce fait inefficace, d'après la direction locale de la coopérative.

Recommendations

1. Des modifications devraient être faites au toit de l'hôtel pour améliorer l'aération du grenier et éliminer le problème de condensation.

2. La disponibilité de la chaleur non-utilisée par l'opération de la boulangerie adjacente, devrait soigneusement être considerée pour un usage possible pour chauffer une partie de l'hôtel.

3. Dans les programmes futurs, CREDA devrait prendre la responsabilité du développement d'un programme spécifique et détaillé de la circulation de l'information, afin d'assurer que les objectifs sont rencontres en ce qui a trait à l'exposition maximale du projet, de la technologie et des avantages économiques possibles.

4. Une maquette d'une coupe, section transversale, de l'immeuble construit devrait être executee pour servir en tant que promotion et être placee dans des endroits publics bien en vue.

5. Les concepts du rehaussement de l'isolation pour la construction de batiments neufs et pour le retrofit de structures existantes, sont recommandés pour l'emploi dans tous les edifices des T.N.O.

2.0 TECHNICAL DESCRIPTION

The Cambridge Bay hotel is a 30' x 120' long two storey structure enclosing a total of 19 guest rooms, a 35' x 30' conference room, a 30' x 30' food service area and other service areas. The Co-op bakery adjoins the food service space. The project supported by CREDA was the upgrading of thermal insulation and other heat loss reduction measures in conjunction with the 1981 construction of the second storey of the structure and the 1982 retrofit of thermal insulation and triple glazed windows on the original one storey structure, originally built in Cambridge Bay in the early 1970's as living quarters for the school construction contractor.

The final construction of the second storey consists of walls with the cross section: R5 insulated exterior siding, tar paper, 3/8" plywood, a 10" thick staggered wall section comprised of 2"x6" at 16" centres on outside and 2"x3" on 16" centres inside, wall section filled with R24 fibreglass insulation, 4 mill polyethylene vapour barrier, ½" vinyl clad drywall interior finish. The insulation value for a representative wall section is an average R31. A sketch of this cross section appears in figure 2.1.

The roof construction of the second storey addition is comprised of R5 insulated aluminum siding, ½" plywood deck, pre-fabricated plywood rafters ('I' beam construction made by a plywood web and 2" x 3" top and bottom) 18" thick, placed 24" o.c., R40 (12"0 fibreglass batt insulation) 4 mil. polyethylene vapour barrier, 1"x3" cross strapping 12" o.c., and 12"x12" paper fibre ceiling tiles. The total insulation value for a representative roof section is an average R46. A total of 16, 36"x36" triple glazed window sets were installed on the second floor.

An air to air heat exchanger was installed to permit energy efficient ventilation of the conference room.

The original design for the second storey, prior to the energy conservation upgrading, considered double glazed windows, no heat exchanger, a single wall construction and reduced insulation in the walls and roof.

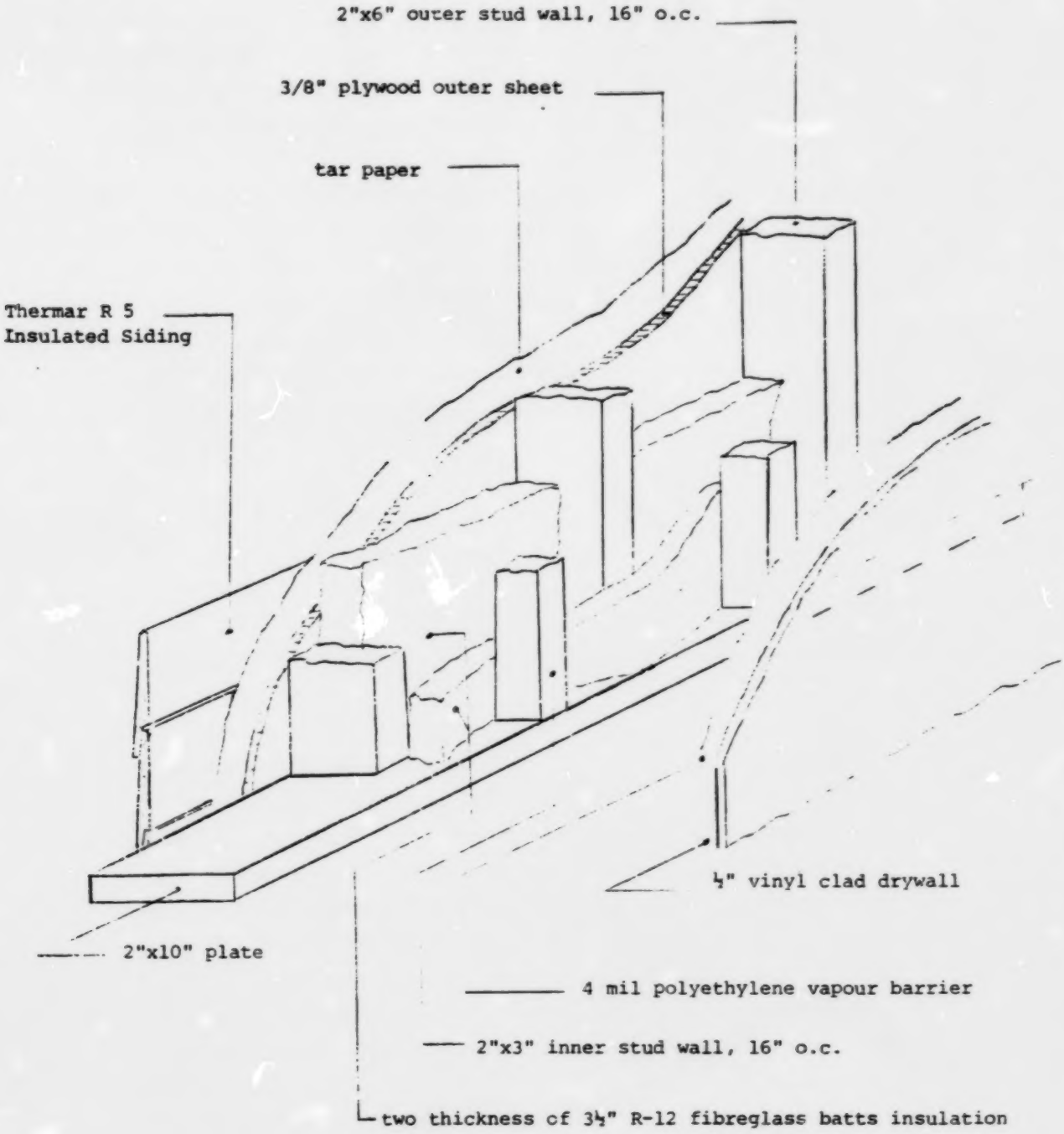
The retrofit work on the first storey consisted of the replacement of the windows with new triple glazed units, the stripping off of old exterior siding and the replacement with 2" thick rigid "blue" styrofoam insulation and R5 insulated aluminum siding. The equivalent insulation value of a representative first floor wall section is now an average of R33.

R20 (6") fibreglass batt insulation was retrofitted to the underside of the sub floor of the original building (after previous plans were scrapped). The cross section of the floor now consists of rug or other floor covering, ½" wood subfloor, 18" deep floor trusses, and a ½" plywood bottom sheet. The upper portion of the space created by the trusses is filled with service lines, plumbing, etc., the lower portion contains the friction fit R20 insulation supported by the bottom sheet.

The aluminum siding employed has the trade name Thermar, manufactured by Hunter Douglas Canada Ltd., Pointe Claire, P.Q., available through Primco, in Edmonton. The siding consists of a 1/16" thick painted aluminum exterior with a tapered (3/16" top - 3/4" bottom) wedge of semi rigid foam insulation bonded to the interior side. The material is shipped in 16' lengths.

The air to air heat exchanger employed was a Van EE air exchanger model R200, supplied by D.C. Heat Exchangers Ltd., Saskatoon, Saskatchewan. The unit is fitted with a 12" blower to draw outside air through the exchanger, over a heating coil and humidifying element, for discharge at floor level in the conference room. An identical sized blower simultaneously withdraws warm air at ceiling level in the conference room passes the air through the exchanger to give up heat to the incoming fresh air, and discharges the air outside the building. The inlet and discharge blowers are each driven by 1.2 Amp., 110 V motors. The operation of the heating coil is regulated by a thermostat on the unit to set the desired inlet air temperatures. A similar control exists to increase the humidity of incoming air to a desired level.

FIGURE 2.1 WALL CROSS SECTION ON THE SECOND STOREY ADDITION


2"x6" outer stud wall, 16" o.c.
3/8" plywood outer sheet
tar paper
Thermar R 5
Insulated Siding
½" vinyl clad drywall
2"x10" plate
4 mil polyethylene vapour barrier
2"x3" inner stud wall, 16" o.c.
two thickness of 3½" R-12 fibreglass batts insulation

The second storey construction project was done by Walter Geary an Edmonton based contractor. The Ikaluktutiak Co-op was unhappy with the quality of finishing work and the service provided by this contractor. The retrofit work was completed by Frank J. Bellerose of F.J.B. Construction Ltd., Cambridge Bay. The Co-op was quite satisfied with the quality of workmanship, attention to detail, and level of service provided.

The heating system for the expanded hotel was only slightly changed to accommodate a 100% increase in heated space. The original Hydrotherm model CSW 1285 dual burner hot water boiler (487,000 BTU/hr, 1974 manufacture) was retained. A second main distribution loop was added to serve the second floor. Heat demand is regulated by zone control valves operated by several thermostats located throughout the building. Hot water is diverted from the main distribution loops by the valves as required to deliver heat through baseboard convectors located in the rooms.

The fuel oil consumed by the original structure prior to retrofit on the upstairs addition was taken from 1980-81 fuel records to be 30,568 litres. Actual fuel consumption for the new building was taken from May 82 - April 83 fuel invoices to be 36,718 litres. Fuel data for the past few years is presented in Table 2.1.

The heat loss calculations performed to support the original proposal for CREDA support was performed by Dean Engineering Ltd., Saskatoon, Saskatchewan. This calculation sheet is presented on the succeeding page for reference.

DEAN CONSULTING ENGINEERING LTD.
SUITE 2-B 806 SPADINA CRES. E.
SASKATOON, SASK. S7K 3H4

project: CAMBRIDGE BAY
file no. | int'l
date | page of

room name & no. EXISTING HOTEL

gross wall	(120.5'+30.5')×2×8'	=	2416 ft²			=	
window	3'×8'×3 + 3'×4'×10	=	255 ft²	× A	125°F / 2 R	=	15938
net wall	+ 3'×7'×3 doors	=	2161 ft²	× B	125°F / 21 R	=	12863
roof	120.5' ×	30.5'		× C	125°F / 20.5	=	22409
~~edge~~ Floor	120.5' ×	30.5'		× D	125°F / 20	=	21875
infiltration	120.5' ×	30.5' ×	8'	× E	0.5 Btu/ft²	=	14701

total room heat loss = 87785 BTU

room name & no. ADDITION PORTION (ONLY)

gross wall	(120.5'+30.5')×2 × 8'	=	2416 ft²				
window & Doors	(3'×3'×18)+(3'×7'×2)	=	204 ft²	× A	125°F/R22	=	12750
net wall		=	2212 ft²	× B	125°F/R29	=	9534
roof	120.5' ×	30.5'		× C	125°F/R46	=	9986
edge				× D		=	
infiltration	120.5' ×	30.5' ×	8'	× E	0.25	=	7351

total room heat loss = 39621 BTU

room name & no. UPGRADING OF EXISTING

gross wall	×	=					
window	×	=		× A		=	
net wall		=	2161 ft²	× B	125/31	=	8714
roof Removed.		×		× C		=	-22409
edge				× D		=	
~~infiltration~~ Remove Wall Portion from Above				E		=	-12863

total ~~room~~ heat loss = 100,848 BTU/hr
Building

room name & no. _____

gross wall	×	=					
window	×	=		× A		=	
net wall		=		× B		=	
roof		×		× C		=	
edge				× D		=	
infiltration	×	×		× E		=	

total room heat loss =

TABLE 2.1 IKALUKTUTIAK CO-OP HOTEL FUEL OIL CONSUMPTION

Invoiced purchases per month (litres)

	1980	1981	1982	1983
JANUARY		2672	5647	3923
FEBRUARY		4559	4359	3671
MARCH		3035	4014	3118
APRIL		2531	3837	2810
MAY		2315	3051	n/a
JUNE	794	n/a	1683	
JULY	-0-	n/a	3548	
AUGUST	3571	n/a	1361	
SEPTEMBER	-0-	n/a	-0-	
OCTOBER	4257	n/a	6559	
NOVEMBER	3975	2328	3522	
DECEMBER	2959	4013	3422	

AUGUST	1981 Fuel Oil Price	45.9¢/litre
AUGUST	1982 Fuel Oil Price	59.6¢/litre
MAY	1983 Fuel Oil Price	71.1¢/litre
n/a	not applicable	

3.0 COST ANALYSIS

The actual capital costs for the addition of the second storey of the hotel were $267,158. The incremental costs for extra materials and labour to upgrade the thermal design of the building are assembled in Table 3.1 together with the costs to retrofit the lower storey of the building. These allocated costs total $35,169, and were incurred in 1981 and 1982.

The cost analysis presented in the CREDA project proposal suggested an annual fuel consumption without the benefit of energy enhancement measures to be 61,172 litres per annum. Predicted savings of 41% were projected with an after retrofit fuel consumption of 36,071 litres expected.

The actual fuel consumption recorded over the last twelve months (Table 2.1) was 36,718 litres. The original fuel data used for the estimates of future fuel savings was based on the June 80 - May 81 time frame, a period with a heating requirement equivalent to 11,674°C degree days. Since the long term average annual heating requirement for the community is 12,036°C degree days, the projected fuel savings were slightly less (1.03) than the 37,193 litres to be expected over the long term.

In 1981, when the project was planned, the estimated payback on capital investment was 27 months. At the point of project completion in the fall of 1982, the economic payback could be computed as $35,169 ÷ (61,172 X 1.031) minus (36,718) X 59.6¢/litre) = 26.9 months. Given the fuel price in May 1983 of 71.1¢/litre this payback period will be effectively less than 24 months. With the $12,000 capital grant from CREDA (the other $10,000 is applied to monitoring and information transfer) this payback is further reduced by 9-10 months.

Therefore, the costs savings predicted at the start of the project have been and continue to be realized. The expected payback of the original investment will occur on schedule and the investment made by the Co-op will be recovered by approximately the end of 1983.

TABLE 3.1 ADDITIONAL COSTS FOR ENERGY CONSERVATION MEASURES

SECOND STOREY ADDITION

MATERIALS:	QTY.		
1. TRIPLE GLAZE WINDOWS - Added cost over double glaze	16		$ 792
2. EXTRA INSULATION - in roof and walls	-	Allow	2,400
3. 2" x 3" x 16' SPRUCE - for double wall	250		3,012
4. VAN EE AIR EXCHANGER	1	Approx.	1,000
LABOUR:			
1. CONSTRUCTION ON 2 x 3 STUD WALL			2,100
2. INSTALL INSULATION			900
		SUB TOTAL	$9,204

FIRST FLOOR RETROFIT

MATERIALS:	QTY.	
1. TRIPLE GLAZE WINDOWS	13	4,820
2. "THERMAR" ALUMINUM SIDING		7,820
3. RIGID STYROFOAM (BLUE) INSULATION	2900 ft^2	2,253
4. R20 FIBREGLASS INSULATION	3600 ft^2	3,072
5. MISCELLANEOUS:		
NAILS, CAULKING, TRIM,		500
LABOUR:		
F.J.B. CONSTRUCTION LTD.		7,500
	SUB TOTAL	$25,965
	TOTAL ENERGY UPGRADING COSTS	$35,169

NOTES:

- 1981 and 1982 prices
- Most materials were purchased in 1981 and shipped to site by air
- labour work was provided in the fall of 1981, and the summer of 1982
- costs of freight included

4.0 PROJECT EXPERIENCES AND PROBLEMS

The construction of the second storey addition to the hotel and the retrofit of the first floor proceeded in a straight forward manner. The work was not technically difficult for the contractors to grasp and involved no risk of failure to successfully complete.

The retrofit portion of the work (1st floor) was performed by a local contractor, with excellent results. The contractor completed the work on time and budget, attended carefully to details and quality workmanship and had no technical problems with the addition of rigid installation or the use of insulated siding.

Problems with the operation of the hotel have occurred with the heating systems, attic space condensation and the air exchanger.

The capacity of the hot water boiler based space heating system was not increased due to the second storey addition. The dining room area of the main floor and the rooms farthest from the boiler room could not be adequately heated during parts of last winter. The boiler was later carefully cleaned, burners were serviced, and lines were bled. The operation of the system improved to eliminate the problem. It is likely that the equipment was not serviced for sometime and the efficiency allowed to deteriorate. The system now must operate closer to capacity than before and may simply need to be better maintained to give satisfactory performance.

On the first days of warmer spring weather (near $0^{\circ}C$), water has seeped through the second floor ceiling tiles in a number of locations. The condition has occurred in each of the two springs since the installation of the new roof. Water leaking after summer rains has not occurred. Condensation damage has not been restricted only to near the attic space vent areas. The roof originally required some repair and sealing by a local contractor since installation in the fall and early winter for 1981. However the roof appears to be leak proof now and the water damage appears to be due to moisture build up in the attic space over the winter as frost and melting in the warmer weather. This problem is all too common

in the north and is usually due to a combination of inadequate attic ventilation (a design fault) and a deficient vapour barrier on the roof. The vapour barrier applied was 4 mil polyetheylene overlapped by 6-8 inches at the edges of the sheets (as observed through removed damaged ceiling tiles). The sheets were not sealed, but simply overlapped and presumably held closed by the weight of fibreglass batt insulation. The vapour barrier was nailed through extensively to attach cross stripping to roof trusses. Attic ventilation was provided by one hooded and baffled 1 ft.^{2} vent hole located at mid span at each end of the building. Free air flow within the attic space could not be determined without damaging the ceiling and was not attempted. It was reported by others that the attic space between the joints is essentially sealed by the plywood roof deck. Therefore virtually 100% of the attic is not ventilated and the end vents are useless.

The air to air heat exchanger has proven to be ineffective at its primary job - provide adequate ventilation and smoke removal to the 35' x 30' conference room. Meeting groups generally open the windows partially to provide sufficient smoke and air ventilation. The unit was operational and able to supply heated outside air to the room. No water line connection to the unit was evident suggesting the humidity control feature was not operative. Specification sheets describing the unit were not available.

The triple glazed window sets, manufactured by Willmar, feature a crank linkage to open and close the window. Some infiltration through the closed windows was detected between the frame and the movable portion of the window in some cases. The windows were not completely reseating in their frames. Ample weather stripping is provided in the frame, and the problem is not too serious or significant at the moment. However, the condition does promote frost build-up in the winter and may be the root cause of window damage when an attempt is made to close the windows on an ice covered sill.

5.0 EFFECTIVENESS AS A DEMONSTRATION

An important benefit of projects funded by CREDA is their value as a demonstration of energy conserving technology to the public or other interested parties. Arctic Co-operatives Ltd. has adopted the high insulation techniques in a number of new buildings including:

Hollman Island	Hotel extension	1982
Gjoa Haven	Hotel	1982
Chesterfield Inlet	Hotel and store	1982
Coral Harbour		Planning
Rankin Inlet		Planning

The practise was adopted on the basis of the projected cost analysis and expected results at Cambridge Bay without detailed actual cost analysis.

On the local scene, insulation retrofit operations have been completed on GNWT owned structures including a fourplex residence, Solar apartments, and two other buildings. Plans exist to apply retrofit insulation to a local church, day care building, and some houses this year.

The Cambridge Bay hotel project has assisted to create these spin-off projects through two means:

a) the project has demonstrated to the new facilities planners, employed by Arctic Co-ops Ltd., the financial benefits created by energy conservation.

b) a sign, set up at the hotel, has caused the public to pay particular attention to the energy conservation measures implemented and the savings possible.

6.0 ASSESSMENT OF THE PROJECT

OVERALL

The project appears to be a successful demonstration of the benefits of enhanced energy conservation measures in a northern community. A local contractor has been familiarized with the concepts involved, and the building owner has the opportunity to apply the concepts to other buildings in the region. The energy cost savings are very close to the values predicted, and despite a cost over run on the capital costs of installation of the new features, the economic payback on the investment has improved over initial predictions due to a significant increase in fuel oil prices in the last two years.

HEATING SYSTEM

The heating system in the hotel could be refined to provide more fuel cost savings to the hotel. During the visit to the hotel in mid May, the building was quite warm even though all zone thermostats were set low. The boiler water supply pressure and temperature were set at the mid-winter set points of 180°F and 8 psig. Furthermore the main distribution loops feeding the zones run under the corriders the full length of the building. Thus even with no zone heat demand two 240+ ' loops are maintained at supply temperature. Daytime heat buildup on the southern exposure further contributed to the high inside temperatures. A simple partial cure is to instruct hotel staff on how to adjust the boiler supply temperature to more closely follow the seasonal needs, instead of having to call in a contract serviceman.

Small design changes in future buildings could improve comfort also. If all zones demand no heat then the distribution legs could be shut off by a solenoid logically coupled to the zone valve solenoids. A very short loop could be maintained local to the boiler if necessary. All rooms common to a heating zone should have similar solar and wind exposures. With rooms on the north side tied into the same zone as

southern exposure rooms, as in some cases now, significant temperature differences may exist between the rooms in the same heating zone.

Serious consideration should be given to using the waste heat from the adjoining bakery to heat the dining room and surrounding area in the hotel. The bakery is very warm and normally requires leaving an outside door partly open for cooling purposes. The bakery operates a Despatch "Baker Boy" model commercial oven manufactured by Kippkelly Ltd., Calgary on a 9 a.m. to 4 p.m., 5 days per week basis. The 8' x 7' x 6'6" size oven is fitted with a 39 kw heater and supplied with 206 V, IIOA, 3 phase electrical service. While air from the bakery cannot be ducted directly to the dining area due to the entrained fumes and odours generated by the bakery activity, a fume hood and heat exchanger arrangement may be economical. A potentially viable concept is to install a fume hood above the oven and withdraw hot air from the room with a blower and exhaust the air to a mixing plenum through a carefully sized air to air heat exchanger.

Ports on the plenum are manually set to mix cooled bakery air with fresh outside air for re-introduction into the room. On the other side of the exchanger, a blower is used to draw air from the dining room space, through the exchanger to pick up heat from the bakery air, and is re-introduced to the dining room space. A sketch of the concept is presented as figure 6.1.

A number of permutations to this concept are possible, and the sizing, economic viability and waste heat available must be quantified. However the basic concept to utilize the heat available should be investigated.

ATTIC VENTILATION

The construction of the roof and attic space for the hotel is poor. The condensation symptoms and the reported design suggest that the attic ventilation system is extremely inadequate. Extra care should have been taken with vapour barrier installation during construction. Under present conditions the condensation problems can be expected to re-occur every spring until the roof prematurely rots and must be replaced. One possible

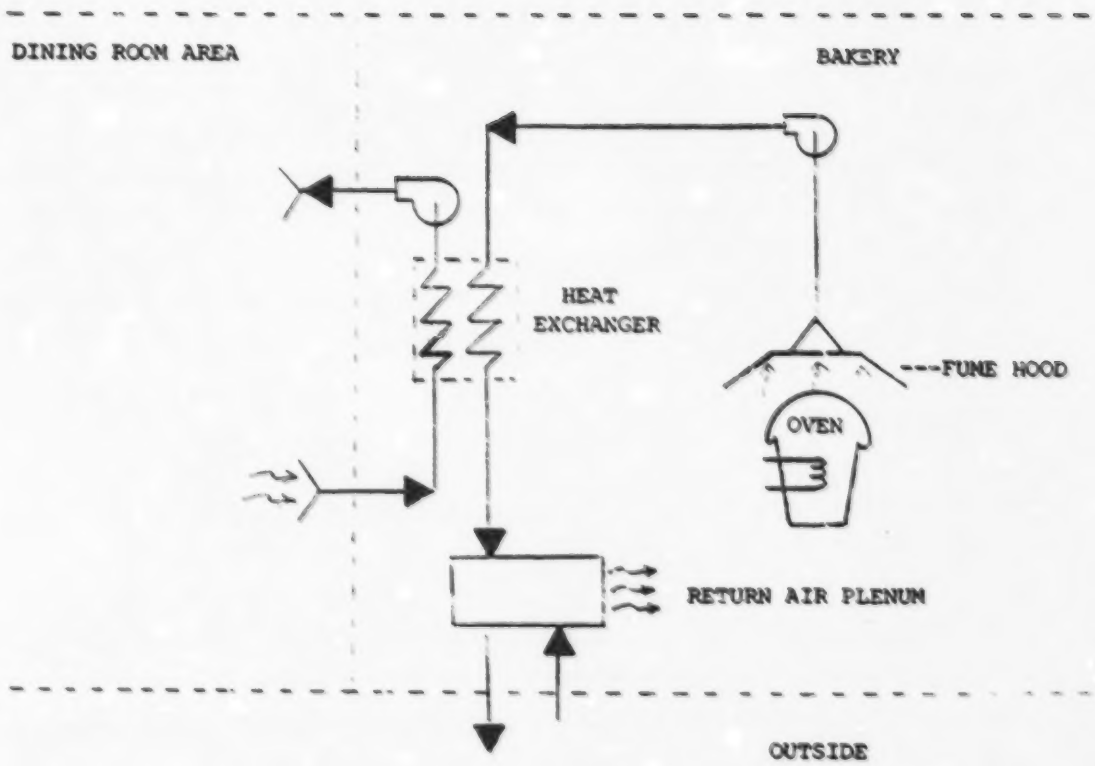


FIGURE 6.1 CONCEPT FOR HEAT RECOVERY FROM THE BAKERY OVENS

solution is to modify the roof by opening up the north and south faces (120' each) of the attic space and then add a plenum box to run the full length of each face. The highly vented plenum will create free circulation through the attic space above the insulation in the ceiling. Moisture that has permeated through the ceiling into the attic can then be picked up and carried away by the freely circulating air.

The air exchanger is simply undersized to do an effective ventilation job in the conference room. An air exhaust velocity of 10-15 ft/sec. was estimated for the unit (actual data was not available). Allowing for the duct area and the room dimensions, the unit at maximum output appears to create one room air change per 30-35 minutes. A more useful capacity may be one air change per 3-5 minutes (1000-1500 cfm), provided by a unit with speed control to vary the flow if desired to a low of 200-300 cfm.

WINDOW LINKAGE

An alternative form of window closure should be considered for the purchase of window sets for future projects. The crank out designs are elegant and provide positive holding of the window at all times (no wind damage). However, the particular design applies little closing force to seat the window in the frame and the linkage is susceptible to distortion at that point. An arrangement that provides a positive means to firmly pull the window into the frame upon closure is preferred.

INFORMATION TRANSFER

The information transfer program was inadequately specified at the outset of the project and few significant activities have been performed to publicize or inform concerning the project. A sign was erected outside the hotel acknowledging the project and CREDA support. Even without explicit effort, reasonable response to the demonstration is evident in other Arctic Co-operatives construction, and in local projects. Numerous ACL and Ikaluktutiak Co-op personnel contacted indicated that little or no other inquiries were received concerning the project at Cambridge Bay.

The demonstration and information transfer value of the project could have been significantly enhanced if a complete detailed action plan and specific tasks list were developed to support the budget. Since the information transfer is the primary product purchased by the CREDA in exchange for its grant, the responsibility for developing the specific details and action items on a program should rest with CREDA.

In addition to a project summary sheet and a final project report, both requested as part of the project, we offer the following suggestions.

1. Construct a model cross section of the wall design used in the hotel for use as a public display. Attach English and Inuktitut signage to describe the construction, the specific demonstration project, the relative extra costs involved and the paybacks possible. Place the display in the airport terminal at Cambridge Bay for a period of time then move the display to other airports and community centres in other northern communities.

2. Request the Co-op prepare and give a presentation on the costs and benefits of the project at their next NWT wide annual general meeting.

3. Request the Co-op to submit a summary of the project, costs and benefits to newspapers for publication throughout the NWT.

AMBRIDGE BAY A REF 014.00010.G01 2500600 1981 CAMBRIDGE BAY A NWT
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1981

ANNUAL TEMPERATURE AND PRECIPITATION ABSTRACT
RESUME DES DONNES DE TEMPERATURE ET DE PRECIPITATION ANNUELLES

EMPERATURE (DEGREES CELSIUS) TEMPERATURE (DEGRES CELSIUS)

MONTH	MEAN/MOYENNE MAXIMUM MAXIMAL	MINIMUM MINIMAL	MEAN MOYENNE	DIFF. NORMAL ECART DE LA NORMAL	EXTREMES MAX.	DATE	MIN.	DATE	DEGREE DAYS/DEGRES JOURS BELOW/AU DESSOUS 18.0	0.0	ABOVE/AU DESSUS 0.0	5.0	10.0	MOIS
ANUARY	-20.5	-28.7	-24.6	9.1	-6.0	16*	-42.2	1	1320.4	762.4	0.0	0.0	0.0	JANVIER
EBRUARY	-27.3	-35.2	-31.3	3.3	-10.4	3	-44.5	21	1379.9	875.9	0.0	0.0	0.0	FEVRIER
ARCH	-24.2	-33.4	-28.8	-1.3	-9.7	23	-41.4	26	1450.9	892.9	0.0	0.0	0.0	MARS
PRIL	-18.9	-28.4	-23.7	-1.5	-3.8	30	-38.4	11*	1250.8	710.8	0.0	0.0	0.0	AVRIL
AY	-3.2	-11.1	-7.2	2.4	2.5	31	-21.4	6	780.1	222.6	0.5	0.0	0.0	MAI
UNE	6.1	0.1	3.1	1.6	13.2	30	-6.0	1	447.6	6.3	98.7	13.7	0.0	JUIN
ULY	11.3	4.3	7.8	-0.4	18.5	26	0.7	28	315.8	0.0	242.2	88.3	3.4	JUILLET
UGUST	10.1	4.1	7.1	0.2	19.2	3	-1.8	29	337.1	0.0	220.9	80.0	4.9	AOUT
EPTEMBER	1.9	-1.4	0.3	0.8	5.5	17	-7.0	27	531.6	25.2	33.6	0.0	0.0	SEPTEMBRE
CTOBER	-4.9	-10.0	-7.5	3.6	2.1	3	-20.5	28	789.5	233.4	1.9	0.0	0.0	OCTOBRE
OVEMBER	-18.4	-24.2	-21.3	2.5	-5.6	1	-36.9	27	1180.8	640.8	0.0	0.0	0.0	NOVEMBRE
ECEMBER	-23.4	-30.0	-26.7	2.9	-15.7	22	-38.5	29	1387.2	829.2	0.0	0.0	0.0	DECEMBRE
NNUAL	-9.3	-16.2	-12.8	2.3	19.2		-44.5		11171.7	5199.5	597.8	182.5	8.3	ANNUELLE

AINFALL/PLUIE (MILLIMETRES)
NOWFALL/NEIGE (CENTIMETRES)
RECIPITATION (MILLIMETRES)

MONTH	TOTAL/TOTALE RAIN PLUIE	SNOW NEIGE	PCPN PCPN	GREATEST/HAUTEUR MAXIMALE RAIN PLUIE	DATE	SNOW NEIGE	DATE	PCPN PCPN	DATE	* *	DAYS WITH/JOURS AVEC RAIN PLUIE	SNOW NEIGE	PCPN PCPN	1≥	2≥	3≥	4≥	MOIS
NUARY	0.0	3.0	3.0	0.0		1.0	14*	1.0	14*	12	0	4	4	31	0	0	0	JANVIER
BRUARY	0.0	2.8	2.6	0.0		1.2	3	1.0	3	14	0	5	5	28	0	0	0	FEVRIER
RCH	0.0	8.6	7.3	0.0		4.4	6	4.1	6	21	0	6	5	31	0	0	0	MARS
RIL	0.0	1.0	1.0	0.0		0.4	8*	0.4	8*	18	0	3	3	30	0	0	0	AVRIL
Y	5.7	4.1	9.3	4.3	20	1.4	1	4.3	20	4	3	5	7	31	3	0	0	MAI
NE	6.4	0.4	6.8	2.2	14	0.4	3	2.2	14	0	4	1	4	13	3	0	0	JUIN
LY	35.0	T	35.0	7.6	16	T	8*	7.6	16	0	15	0	15	0	0	1	0	JUILLET
GUST	32.6	0.9	33.5	12.3	10	0.6	10	12.9	10	0	16	2	16	3	0	3	0	AOUT
PTEMBER	8.0	7.3	15.3	3.0	3	4.2	2	4.6	2	3	7	4	10	22	1	0	0	SEPTEMBRE
TOBER	2.8	5.7	8.2	1.8	4	1.3	2	1.8	4	4	2	11	13	31	3	0	0	OCTOBRE
VEMBER	T	5.4	5.4	T	T	1.6	25	1.6	25	8	0	7	7	30	0	0	0	NOVEMBRE
CEMBER	0.0	2.2	2.2	0.0		0.8	18	0.8	18	10	0	6	6	31	0	0	0	DECEMBRE
NUAL	90.5	41.1	129.1	12.3		4.4		12.9			47	54	95	281	10	4	0	ANNUELLE

ND OF MONTH SNOW DEPTH/NEIGE ACCUMULEE AU SOL (FIN DU MOIS)
AYS WITH FREEZING TEMPERATURE/JOURS AVEC TEMPERATURE EGALE OU INFERIEURE AU POINT DE CONGELATION
DAYS WITH FREEZING PRECIPITATION/JOURS AVEC PRECIPITATION VERGLACANTE
DAYS WITH THUNDERSTORMS/JOURS AVEC ORAGES
DAYS WITH HAIL/JOURS AVEC GRELE

SEVERAL (PLUSIEURS) E ESTIMATED/ESTIME M MISSING/MANQUANTE T TRACE

TABLEAU 001 REF 101.00108.A01 DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TM-0

MEAN DAILY MAXIMUM TEMPERATURE (DEGREES CELSIUS)
TEMERATURE MAXIMALE QUOTIDIENNE MOYENNE MENSUELLE (DEGRE CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1929	-25.6	-26.7	-29.2	-15.1	-7.8	9.0	10.4	M	M	M	M	M	M	1929
1930	M	M	M	M	M	10.5	20.1	12.9	1.4	-8.5	M	M	M	1930
MEAN	-25.6	-26.7	-29.2	-15.1	-7.8	7.3	15.3	12.9	1.4	-8.5	M	M	M	MOYENNE
1931	M	M	M	M	M	-6.1	7.4	M	7.8	3.5	-5.4	-18.9	M	M	M	1931
1932	M	M	M	-19.3	M	M	6.6	M	M	M	M	M	M	M	M	1932
MISSING 1933 MANQUANT														
1934	M	M	M	M	M	M	M	M	M	-10.0	-16.9	M	M	M	M	1934
1935	M	M	-26.1	-16.8	-6.0	6.7	14.1	11.6	1.2	M	-23.4	-28.2	M	M	M	1935
1936	-25.6	-29.7	-27.5	-19.9	-7.8	3.6	M	M	M	-13.3	-22.6	-30.6	M	M	M	1936
1937	-29.1	-32.4	-24.9	-17.2	-5.3	M	12.9	M	M	-6.4	-18.9	-29.6	M	M	M	1937
1938	-27.1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	1938
1939	-32.4	M	-32.6	-13.1	-4.3	2.7	M	M	M	M	M	-28.7	M	M	M	1939
1940	-18.9	-28.5	-20.8	-10.0	-2.7	2.5	12.4	7.0	5.2	-7.2	-19.4	-25.9	-8.6	M	M	1940
MEAN	-28.6	-30.9	-26.3	-16.1	-5.4	4.9	13.1	9.1	3.3	-8.5	-20.0	-28.1	-11.1	MOYENNE		
1941	-28.3	-33.4	-27.3	-20.6	-6.1	6.5	15.4	8.6	-0.8	-8.3	-23.7	-28.8	-11.6	M	M	1941
1942	-28.3	-33.0	-31.9	-17.2	-4.2	3.7	12.8	8.6	M	-9.0	-22.1	-28.8	M	M	M	1942
1943	-28.3	-30.1	-28.3	M	-6.9	5.6	12.0	11.9	M	-6.3	-16.3	-28.1	M	M	M	1943
1944	-28.3	-32.7	-28.3	M	M	6.4	10.6	9.2	1.9	-6.8	-17.3	-28.1	M	M	M	1944
1945	-28.3	-32.7	-28.3	-21.4	-6.3	M	M	M	M	-6.7	-20.3	-28.6	M	M	M	1945
1946	-32.1	-33.5	-31.6	-17.6	-5.1	3.9	12.3	11.2	-0.9	-11.7	-19.7	-28.9	-12.8	M	M	1946
1947	-30.7	-33.5	-31.6	-17.3	-3.3	M	M	M	M	M	M	M	M	M	M	1947
1948	M	-30.5	-27.9	-18.6	-3.9	5.9	15.3	11.7	3.7	-7.7	-19.2	-28.1	M	M	M	1948
1949	-30.1	-33.8	-28.0	-16.1	-6.0	1.3	9.3	12.2	3.7	-8.6	-18.7	-28.2	-11.6	M	M	1949
1950	-31.7	-33.8	-31.6	-17.6	-6.4	3.4	9.7	9.8	2.6	-12.2	-21.4	-28.8	-12.9	M	M	1950
MEAN	-29.8	-30.4	-24.1	-18.3	-5.8	4.9	12.2	10.2	1.8	-7	-19.8	-28.9	-11.1	MOYENNE		
1951	-27.8	-33.0	-28.1	-17.3	-4.3	5.3	10.8	11.1	2.1	-8.2	-21.9	-31.0	-10.3	M	M	1951
1952	-32.2	-32.6	-26.9	-12.2	0.2	6.4	12.5	7.9	0.3	-10.1	-20.1	-31.0	-10.7	M	M	1952
1953	-30.8	-34.8	-28.6	-11.6	-6.9	4.2	11.9	11.2	3.2	-8.6	-17.0	-28.3	-10.7	M	M	1953
1954	-30.8	-33.1	-28.3	-20.6	-5.0	3.0	12.6	13.6	4.8	-7.3	-19.2	-28.3	-10.7	M	M	1954
1955	-30.7	-33.7	-28.3	-15.7	-5.8	4.3	12.4	9.7	1.7	-9.0	-20.8	-27.3	-10.7	M	M	1955
1956	-30.7	-33.7	-28.3	-17.7	-9.5	4.3	14.1	8.3	-0.6	-10.9	-21.1	-29.2	-10.7	M	M	1956
1957	-30.4	-33.7	-28.7	-16.7	-8.5	2.3	10.3	9.2	2.9	-6.1	-22.9	-32.2	-10.7	M	M	1957
1958	-32.6	-36.2	-28.9	-21.1	-9.3	2.8	11.4	12.3	3.8	-6.0	-22.6	-32.2	-10.7	M	M	1958
1959	-30.4	-33.9	-28.8	-18.2	-9.6	1.7	9.3	7.6	1.7	-10.0	-20.1	-28.3	-11.7	M	M	1959
1960	-30.8	-30.9	-27.8	-16.2	-5.1	5.8	13.1	10.6	2.2	-8.9	-22.4	-32.7	-11.8	M	M	1960
MEAN	-29.3	-31.9	-27.3	-16.7	-5.7	4.4	11.9	10.4	2.1	-8.0	-21.0	-28.7	-11.8	MOYENNE		
1961	-32.6	-29.7	-34.5	-17.8	-7.3	5.3	14.5	11.7	-1.4	-12.3	-18.8	-30.9	-10.3	M	M	1961
1962	-30.1	-33.3	-32.3	-17.9	-9.0	7.1	13.7	10.7	2.6	-8.7	-21.8	-28.9	-11.3	M	M	1962
1963	-31.6	-27.8	-32.9	-18.1	-7.5	4.3	10.7	9.9	0.2	-7.3	-17.9	-28.7	-11.3	M	M	1963
1964	-30.3	-34.6	-28.2	-20.6	-5.8	4.8	10.3	10.8	1.4	-8.3	-17.9	-28.1	-10.8	M	M	1964
1965	-30.3	-34.6	-28.1	-17.1	-5.3	2.8	11.3	8.7	-1.2	-12.2	-18.2	-28.1	-10.8	M	M	1965
1966	-30.7	-31.9	-28.0	-19.4	-2.6	6.6	13.3	10.5	3.9	-12.1	-22.7	-31.1	-12.8	M	M	1966
1967	-30.4	-33.9	-27.9	-19.3	-5.9	5.8	10.7	8.4	-1.0	-5.1	-22.8	-32.6	-12.8	M	M	1967
1968	-32.0	-29.8	-33.4	-19.2	-6.6	5.8	9.4	8.3	2.8	-3.4	-17.9	-29.3	-10.8	M	M	1968
1969	-30.2	-33.8	-27.1	-15.3	-7.1	0.6	13.9	10.3	3.8	-3.9	-20.1	-29.3	-10.8	M	M	1969
1970	-28.2	-33.8	-27.4	-17.6	-6.6	6.9	13.6	10.7	2.3	-5.8	-19.3	-28.7	-10.7	M	M	1970
MEAN	-31.7	-30.8	-27.2	-18.1	-6.2	4.2	12.1	9.6	1.3	-7.6	-19.7	-28.7	-11.7	MOYENNE		
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 001
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REF 101.00108.801

BEGAN JAN 1929 2500600 CAMBRIDGE BAY A
DEBUT JAN 1929 2500600 CAMBRIDGE BAY A

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MEAN DAILY MAXIMUM TEMPERATURE (DEGREES CELSIUS)
TEMERATURE MAXIMALE QUOTIDIENNE MOYENNE MENSUELLE (DEGRE CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1971	-28.3	-29.3	-25.1	-16.3	-5.5	6.8	13.1	8.9	3.2	-4.3	-22.1	-22.0	-10.7	1971
1972	-31.5	-35.4	-25.4	-21.7	-8.3	0.9	9.6	7.5	-2.7	-12.2	-21.1	-28.3	-9.6	1972
1973	-27.9	-30.6	-29.1	-18.8	-2.8	8.9	12.9	12.5	4.0	-3.1	-16.4	-24.3	-9.6	1973
1974	-29.3	-32.1	-28.4	-20.8	-5.1	4.9	13.7	9.2	-0.9	-12.0	-18.1	-27.8	-11.4	1974
1975	-33.2	-28.9	-27.2	-11.4	-1.3	11.2	11.8	12.6	1.7	-7.6	-18.2	-29.3	-10.1	1975
1976	-30.4	-30.5	-28.6	-11.1	-4.2	2.8	12.8	8.1	2.0	-7.5	-20.2	-29.0	-10.8	1976
1977	-26.3	-31.8	-26.6	-13.4	-4.2	6.5	12.0	8.8	3.7	-7.0	-19.6	-26.0	-9.2	1977
1978	-25.6	-33.1	-26.6	-18.7	-8.5	-0.5	7.5	6.1	1.4	-15.3	-21.0	-27.5	-9.8	1978
1979	-26.4	-35.1	-29.8	-17.4	-4.1	2.0	11.0	7.0	0.5	-10.4	-13.5	-27.3	-9.6	1979
1980	-31.0	-22.1	-26.2	-18.8	-3.8	5.2	10.4	10.8	0.8	-7.8	-23.7	-26.8	-9.8	1980
MEAN	-28.9	-29.9	-27.3	-16.8	-4.8	4.9	11.5	9.2	1.4	-8.8	-19.4	-27.2	-11.3	MOYENNE

PERIOD OF RECORD/PERIODE DES RELEVES

MEAN	-29.7	-30.7	-26.5	-17.2	-5.6	4.6	12.2	9.8	1.7	-8.1	-20.1	-26.6	-11.3	MOYENNE
STD.DEV.	3.3	3.4	3.0	3.0	2.1	2.6	2.2	2.0	1.9	2.9	2.4	3.0	1.1	ECART-TYPE
# OF YEARS	45	44	46	45	46	46	43	42	40	45	45	44		DUREE ANNEES
PERCENTILES														PERCENTILES
95% <	-25.3	-23.6	-21.4	-11.1	-1.8	10.3	15.4	12.9	4.8	-3.9	-16.1	-20.6	-9.8	95%
75% <	-27.3	-28.0	-24.9	-15.8	-4.2	6.5	13.6	11.2	3.4	-6.1	-18.2	-24.8	-10.8	75%
50% <	-30.1	-31.1	-26.6	-17.4	-6.0	4.3	12.3	9.3	1.8	-7.6	-20.1	-26.6	-12.3	50%
25% <	-32.1	-33.2	-28.5	-19.3	-7.2	2.8	10.6	8.3	0.4	-10.3	-21.8	-29.0	-13.3	25%
5% <	-35.4	-35.4	-32.5	-21.3	-9.3	0.7	9.3	7.1	-1.4	-13.2	-23.7	-31.6	-13.5	5%

CODE 1

NORMALS/NORMALES 1951-80

MEAN	-30.0	-30.9	-27.3	-17.2	-5.6	4.5	11.9	9.7	1.6	-8.1	-20.0	-26.5	-11.5	MOYENNE
STD.DEV.	2.7	3.5	2.6	3.0	2.4	2.8	1.7	2.0	1.9	3.1	2.4	3.3	1.0	ECART-TYPE
# OF YEARS	30	30	30	30	30	30	30	30	30	30	30	30		DUREE ANNEES
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 002
TABLEAU 002

REF 101:00108:C01
REF 101.00108.C01

BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

MEAN DAILY MINIMUM TEMPERATURE (DEGREES CELSIUS)
TEMPERATURE MINIMALE QUOTIDIENNE MOYENNE MENSUELLE (DEGRE CELSIUS)

YEAR / JAN / FEB / MAR / APR / MAY / JUN / JUL / AUG / SEP / OCT / NOV / DEC / ANNUAL / ANNEE
JAN / FEV / MARS / AVR / MAI / JUIN / JUIL / AOUT / SEPT / OCT / NOV / DEC / ANNUELLE / ANNEE
1929 -32.9 -34.2 -35.9 -26.3 -17.2 -2.2 2.8 M M M M M M 1929
1930 M M M M M -0.2 5.5 4.3 -2.8 -15.7 -25.9 -33.6 M 1930
MEAN -32.4 -34.2 -35.9 -26.3 -17.2 -1.2 4.2 4.3 -2.8 -15.7 -25.9 -33.6 -18.1 MOYENNE
1931 -39.1 -37.6 -38.8 -23.8 -14.4 1.5 M 3.1 0.9 -11.2 -24.8 -33.8 M 1931
1932 -36.9 -42.2 -34.4 -28.1 M 0.6 M M M M M M M 1932
MISSING 1933 MANQUANT
1934 M M M M M M M M M M M M M 1934
1935 M M M M M M M M M M M M M 1935
1936 -[illegible].0 -36.3 -36.1 -27.2 -15.3 -0.3 5.8 5.7 -2.0 -16.4 -24.3 -35.8 M 1936
1937 -[illegible].8 -41.1 -37.1 -27.8 -15.8 -2.1 M M M M -30.3 -35.5 M 1937
1938 -35.1 -37.5 -33.8 -24.5 -13.3 M 4.8 M M -21.8 -29.2 -36.9 M 1938
1939 -34.0 M M M M M M M M -12.1 -26.2 -35.9 M 1939
1940 -37.1 -38.3 -37.7 -21.8 -10.9 -1.5 M M M M M M M 1940
MEAN -36.6 -38.1 -35.5 -25.2 -13.2 -0.8 3.5 4.4 -0.7 -12.7 -28.4 -33.0 -16.6 1940
1941 -36.3 -33.0 -33.6 -27.2 -13.1 0.0 5.6 2.5 -5.6 -13.4 -31.6 -32.7 -18.4 1941
1942 -33.7 -40.1 -30.2 -26.4 -9.3 -0.6 8.1 4.7 M -8.2 -28.5 -32.7 M 1942
1943 -36.9 -35.2 -30.6 M -11.9 1.1 8.1 8.6 M -11.2 -23.8 -32.9 M 1943
1944 -39.9 -37.7 -33.3 M M -0.6 5.8 3.4 -2.2 -12.4 -24.8 -34.9 M 1944
1945 -33.7 -35.2 -29.9 -31.5 -14.8 M M M M -12.9 -29.1 -34.1 M 1945
1946 -37.1 -40.9 -27.6 -22.2 -11.0 -1.9 2.6 3.4 -5.1 -10.3 -27.1 -33.4 -18.2 1946
1947 -37.9 -36.2 -29.5 -26.4 -14.7 M M M M M M M M 1947
1948 M -39.2 -36.2 -29.8 -11.8 -0.7 6.6 4.8 -1.7 -14.2 -25.6 -37.4 M 1948
1949 -37.2 -41.4 -33.7 -26.4 -16.7 -3.7 2.1 4.2 -1.6 -16.7 -28.7 -31.7 -19.0 1949
1950 -42.4 -39.2 -31.4 -28.7 -14.6 -3.1 2.8 1.8 -2.0 -18.6 -27.8 -32.6 -19.7 1950
MEAN -36.6 -37.7 -31.6 -27.4 -13.1 -1.2 5.0 4.2 -3.0 -14.2 -27.1 -33.0 -18.0 MOYENNE
1951 -34.2 -41.4 -34.9 -27.4 -10.6 -0.9 3.2 3.5 -2.7 -15.9 -28.1 -36.2 -18.7 1951
1952 -38.9 -38.7 -35.7 -27.4 -7.2 0.4 3.6 2.3 -4.2 -16.4 -27.2 -28.9 -17.7 1952
1953 -32.4 -39.4 -39.2 -20.6 -14.7 -1.8 3.4 3.6 -2.4 -15.7 -25.8 -35.6 -18.1 1953
1954 -37.3 -37.2 -32.7 -30.0 -13.4 -1.6 5.4 6.6 0.8 -15.2 -25.8 -35.6 -18.1 1954
1955 -33.8 -41.1 -36.0 -23.2 -12.4 -0.8 3.2 3.7 -2.3 -9.9 -27.7 -35.3 -17.9 1955
1956 -36.9 -38.6 -36.5 -26.3 -18.9 -2.0 4.6 2.4 -3.9 -17.1 -27.8 -35.8 -17.9 1956
1957 -38.9 -38.8 -31.2 -25.8 -15.6 -2.7 2.9 3.5 -1.6 -12.8 -30.6 -35.9 -17.8 1957
1958 -34.9 -42.3 -34.3 -30.7 -11.1 -2.3 4.2 3.5 -0.7 -12.0 -30.6 -35.9 -17.8 1958
1959 -34.3 -36.1 -35.3 -25.6 -17.8 -2.8 2.9 2.2 -2.6 -17.9 -26.6 -35.4 -18.6 1959
1960 -38.7 -37.2 -37.1 -27.4 -8.4 -1.9 3.2 3.8 -2.2 -14.5 -27.9 -33.5 -18.9 1960
MEAN -36.6 -38.6 -34.8 -25.7 -13.0 -1.3 3.9 3.8 -2.2 -14.5 -27.9 -33.5 -18.9 MOYENNE
1961 -37.0 -35.3 -40.3 -28.0 -14.9 -0.7 5.1 2.4 -5.9 -19.3 -27.2 -37.1 -20.3 1961
1962 -39.7 -40.0 -30.9 -26.0 -16.8 0.7 5.0 2.0 -2.0 -19.3 -28.6 -33.4 -18.8 1962
1963 -37.9 -39.1 -39.9 -28.7 -15.5 -1.4 5.0 2.7 -2.7 -16.2 -29.1 -34.6 -19.6 1963
1964 -36.8 -39.8 -35.2 -27.3 -14.3 -2.3 5.1 2.3 -6.4 -16.8 -27.6 -34.9 -19.6 1964
1965 -38.3 -39.1 -36.2 -29.0 -9.4 0.1 5.3 4.8 -5.1 -16.6 -30.9 -33.9 -18.6 1965
1966 -39.3 -39.8 -36.2 -28.6 -15.7 -5.0 5.3 2.3 -5.1 -16.6 -30.9 -33.9 -18.6 1966
1967 -38.4 -38.2 -32.3 -29.1 -15.8 -0.1 5.3 2.8 -0.6 -16.7 -29.7 -34.9 -18.6 1967
1968 -38.4 -38.2 -32.3 -29.1 -15.8 -0.1 5.3 2.8 -0.6 -16.7 -29.7 -34.9 -18.6 1968
1969 -37.7 -39.4 -35.6 -25.6 -14.8 0.2 5.1 4.4 -3.3 -14.9 -26.7 -34.4 -18.6 1969
1970 -38.1 -37.8 -32.4 -27.9 -14.2 -1.6 4.0 3.3 -3.3 -14.9 -27.1 -32.7 -18.6 1970
MEAN -38.1 -37.8 -32.4 -27.9 -14.2 -1.6 4.0 3.3 -3.3 -14.9 -27.1 -32.7 -18.6 MOYENNE
JAN / FEV / MARS / AVR / MAI / JUIN / JUIL / AOUT / SEPT / OCT / NOV / DEC / ANNUELLE / ANNEE

1965	-31.3	-34.1	-36.1	-30.7	-14.3	-2.3	2.6	3.5	-2.7	-15.6	-24.1	-33.5	-18.8	1965
1966	-36.8	-40.8	-34.2	-27.3	-14.3	-2.3	3.1	2.4	-6.4	-16.8	-27.6	-34.6	-19.4	1966
1967	-31.9	-32.1	-33.7	-29.0	-9.4	0.1	5.1	4.8	-1.1	-18.6	-30.4	-29.9	-19.6	1967
1968	-38.3	-39.8	-36.2	-28.6	-13.7	-5.0	2.3	1.9	-5.3	-11.4	-29.7	-30.9	-18.6	1968
1969	-38.1	-38.3	-32.3	-29.1	-15.8	-0.1	3.2	2.8	-0.6	-8.4	-24.7	-31.4	-19.6	1969
1970	-36.4	-34.6	-35.7	-24.3	-14.7	-4.6	4.2	4.3	-1.6	-9.9	-27.5	-26.1	-17.7	1970
MEAN	-34.1	-37.7	-32.4	-25.6	-14.8	0.2	5.1	4.4	-2.2	-13.9	-26.7	-37.3	-17.3	MOYENNE
	-38.2	-37.8	-35.4	-27.4	-14.2	-1.6	4.0	3.3	-3.2	-14.5	-27.1	-32.7	-18.7	
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 002
TABLEAU 002

REF |01:00108.D01|
REF |01.00108.D01|

BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

MEAN DAILY MINIMUM TEMPERATURE (DEGREES CELSIUS)
TEMPERATURE MINIMALE QUOTIDIENNE MOYENNE MENSUELLE (DEGRE CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	
1971	-34.2	-36.0	-33.1	-25.4	-13.7	0.2	5.3	3.3	-1.2	-10.2	-29.1	-36.0	-17.8	1971
1972	-39.1	-42.1	-33.9	-31.7	-17.8	-4.3	2.2	1.2	-7.6	-20.3	-30.4	-35.1	-21.6	1972
1973	-36.6	-38.4	-38.3	-29.1	-10.8	1.1	4.7	6.5	-0.8	-10.6	-24.8	-31.7	-17.4	1973
1974	-37.1	-39.9	-36.2	-31.8	-19.1	-3.1	5.1	2.7	-6.7	-20.2	-25.9	-35.9	-20.1	1974
1975	-40.5	-35.6	-35.6	-20.7	-6.6	2.8	3.9	4.9	-3.8	-15.3	-26.9	-35.7	-17.4	1975
1976	-37.9	-38.4	-36.6	-21.6	-13.4	-3.1	3.8	1.9	-2.1	-16.0	-28.4	-36.3	-19.0	1976
1977	-39.0	-39.6	-34.6	-22.4	-10.6	0.1	4.5	3.3	-0.6	-14.4	-28.0	-33.9	-17.5	1977
1978	-34.1	-31.5	-34.8	-27.9	-17.1	-4.9	1.5	0.6	-3.3	-23.0	-27.7	-31.2	-19.5	1978
1979	-33.8	-41.3	-37.5	-27.2	-12.2	-4.0	3.2	1.4	-4.3	-18.8	-23.7	-34.5	-19.4	1979
1980	-37.6	-31.5	-33.9	-27.5	-10.4	-0.6	4.1	4.2	-1.0	-15.0	-31.6	-33.4	-18.2	1980
MEAN	-36.5	-37.4	-35.5	-26.5	-12.7	-1.6	3.8	3.0	-3.4	-16.4	-27.7	-34.3	-18.8	MOYENNE
					PERIOD OF RECORD/PERIODE DES RELEVES									
MEAN	-36.8	-37.8	-34.5	-26.5	-13.3	-1.3	4.2	3.5	-2.8	-14.9	-27.4	-33.6	-18.4	MOYENNE
STD.DEV.	2.8	2.8	2.8	3.0	2.9	1.9	1.5	1.6	1.9	3.5	2.1	2.5	1.0	ECART-TYPE
# OF YEARS	48	48	48	46	46	46	43	42	40	45	46	47		DUREE ANNEES
PERCENTILES														PERCENTILES
95% <	-33.0	-32.2	-29.7	-20.9	-7.6	1.8	7.8	6.5	0.0	-8.9	-23.8	-28.9	-17.2	95%
75% <	-34.2	-35.7	-32.8	-24.2	-11.0	0.1	5.9	4.5	-1.6	-12.4	-25.7	-32.4	-17.7	75%
50% <	-37.1	-38.3	-34.5	-27.2	-13.7	-1.4	3.9	3.4	-2.3	-15.3	-27.6	-33.6	-18.5	50%
25% <	-39.7	-40.0	-36.2	-28.6	-15.4	-2.7	3.1	2.4	-4.1	-17.9	-29.1	-35.8	-19.9	25%
5% <	-41.6	-42.2	-39.4	-31.6	-17.8	-4.8	2.1	1.2	-6.4	-21.4	-31.3	-37.2	-20.4	5%
	CODE 1					NORMALS/NORMALES 1951-80						CODE 1		
MEAN	-37.1	-37.9	-35.2	-26.6	-13.3	-1.5	3.9	3.4	-2.9	-15.1	-27.6	-33.5	-18.6	MOYENNE
STD.DEV.	2.3	2.8	2.3	3.2	3.1	2.0	1.1	1.4	2.0	3.5	2.1	2.8	1.0	ECART-TYPE
# OF YEARS	30	30	30	30	30	30	30	30	30	30	30	30		DUREE ANNEES
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 003 REF 101:00108:E01 BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
TABLEAU 003 REF 101:00108:E01 DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

MEAN DAILY TEMPERATURE (DEGREES CELSIUS)
TEMPERATURE QUOTIDIENNE MOYENNE (DEGRE CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1929	-29.8	-30.5	-32.6	-20.7	-12.5	0.9	6.6	M	M	M	M	M	M	1929
1930	M	M	M	M	M	5.2	12.8	8.6	-0.7	-12.1	M	M	M	1930
MEAN	-29.0	-30.5	-32.6	-20.7	-12.5	3.1	9.7	8.6	-0.7	-12.1	M	M	M	MOYENNE
1931	M	M	M	M	-10.3	4.5	M	5.5	1.8	-8.3	-21.9	M	M	1931
1932	M	M	M	-23.7	M	3.6	M	M	M	M	M	M	M	1932
MISSING 1933		MANQUANT												
1934	M		M	M	M	M	M	M	M	-13.2	-20.7	M	M	1934
1935	M	M	-31.1	-22.0	-10.7	3.2	10.0	8.7	-0.4	M	-26.9	-31.9	M	1935
1936	-38.2	-37.9	-32.3	-23.9	-11.8	0.8	M	M	M	-17.6	-25.9	-33.5	M	1936
1937	-32.1	-35.0	-29.4	-20.9	-9.3	M	8.9	M	M	-9.3	-22.6	-32.8	M	1937
1938	-30.6	M	M	M	M	M	M	M	M	M	M	M	M	1938
1939	-34.8	M	-35.1	-17.5	-7.6	0.6	M	M	M	M	M	-29.4	M	1939
1940	-23.7	-29.6	-25.8	-16.7	-6.2	-0.2	8.0	4.6	2.3	-10.0	-23.9	-30.0	-12.6	1940
MEAN	-31.9	-34.2	-30.7	-20.8	-9.3	2.1	9.0	6.3	1.2	-11.7	-23.7	-31.5	-14.6	MOYENNE
1941	-32.6	-29.2	-30.5	-23.9	-9.6	3.3	10.5	5.6	-3.2	-11.9	-27.7	-29.3	-14.9	1941
1942	-29.5	-36.6	-26.1	-21.8	-6.8	1.6	10.5	6.7	M	-6.1	-25.3	-29.8	M	1942
1943	-33.7	-32.2	-28.0	M	-9.4	2.9	10.1	10.3	M	-8.1	-19.7	-29.0	M	1943
1944	-30.1	-34.0	-29.3	M	M	2.9	7.2	6.3	-0.2	-10.0	-21.0	-25.6	M	1944
1945	-30.1	-31.5	-25.9	-26.5	-10.7	M	M	M	M	-9.8	-24.7	-30.4	M	1945
1946	-34.6	-32.2	-25.6	-20.2	-7.6	0.8	7.5	7.3	-2.8	-15.0	-23.4	-30.2	-15.1	1946
1947	-34.3	-32.1	-25.4	-21.9	-11.0	M	M	M	M	M	M	M	M	1947
1948	M	-34.9	-31.8	-24.2	-7.6	2.6	11.0	8.3	1.0	-11.0	-22.5	-33.8	M	1948
1949	-33.7	-38.0	-29.4	-21.4	-11.8	-1.2	5.7	8.2	1.1	-12.2	-22.2	-28.5	-16.3	1949
1950	-39.1	-35.3	-26.6	-23.2	-10.5	0.2	6.3	4.8	0.3	-15.4	-24.6	-29.1	-16.0	1950
MEAN	-33.1	-34.1	-27.9	-22.9	-9.4	1.6	8.6	7.2	-0.6	-11.1	-23.5	-29.5	-14.6	MOYENNE
1951	-30.9	-37.2	-31.5	-22.4	-7.5	2.2	7.0	7.3	-0.3	-11.6	-24.8	-33.6	-15.3	1951
1952	-35.6	-35.7	-31.3	-16.8	-3.5	3.4	8.1	5.1	-2.0	-13.3	-23.7	-25.1	-14.2	1952
1953	-36.6	-30.6	-30.4	-15.9	-10.6	1.2	7.7	7.4	6.4	-12.1	-21.4	-32.4	-14.4	1953
1954	-33.8	-33.2	-29.0	-24.8	-9.7	0.7	9.5	11.0	2.8	-11.3	-22.1	-31.9	-14.3	1954
1955	-31.3	-38.2	-32.7	-19.2	-9.1	1.8	7.8	6.7	-0.3	-7.4	-24.3	-31.3	-14.8	1955
1956	-30.6	-35.7	-32.6	-22.0	-13.9	1.2	9.4	5.4	-2.3	-14.0	-24.5	-32.6	-16.0	1956
1957	-34.7	-36.1	-28.0	-21.3	-12.1	-0.1	6.6	6.4	0.7	-9.4	-26.8	-34.6	-15.8	1957
1958	-31.3	-39.3	-30.1	-25.9	-7.7	0.3	7.8	8.8	1.6	-9.0	-27.5	-28.9	-15.1	1958
1959	-30.3	-32.5	-31.6	-21.2	-13.7	-0.6	6.1	4.9	-0.5	-14.9	-23.4	-29.7	-15.2	1959
1960	-34.8	-34.1	-33.4	-22.8	-5.8	5.9	9.2	7.9	-0.4	-10.0	-25.8	-26.3	-14.2	1960
MEAN	-33.0	-35.3	-31.1	-21.2	-9.4	1.6	7.9	7.1	0.0	-11.3	-24.5	-30.1	-14.9	MOYENNE
1961	-35.2	-32.5	-37.7	-23.9	-11.1	1.5	9.8	5.1	-3.7	-15.9	-23.0	-33.8	-16.7	1961
1962	-34.4	-36.7	-26.6	-23.0	-12.9	3.9	9.4	6.9	0.3	-11.8	-25.1	-29.9	-15.0	1962
1963	-34.7	-31.0	-36.2	-18.9	-11.5	1.5	7.3	6.2	-1.9	-11.8	-21.0	-28.7	-15.1	1963
1964	-38.0	-34.9	-34.5	-25.8	-7.9	-0.3	6.5	7.2	-0.7	-12.3	-20.9	-29.7	-15.9	1964
1965	-33.4	-37.6	-29.7	-22.2	-9.8	0.3	7.2	5.6	-3.8	-13.0	-22.9	-31.4	-15.9	1965
1966	-38.3	-36.3	-29.3	-24.5	-6.9	3.4	9.3	7.7	1.2	-15.5	-26.6	-26.5	-15.0	1966
1967	-35.4	-36.9	-32.1	-24.0	-9.8	-1.6	6.5	5.2	-3.2	-8.3	-26.3	-26.8	-16.1	1967
1968	-35.1	-33.6	-27.9	-24.2	-11.2	2.6	6.3	5.6	1.1	-5.9	-21.3	-27.9	-14.3	1968
1969	-34.0	-29.8	-31.4	-19.8	-10.9	-2.0	9.1	7.4	0.1	-8.7	-23.8	-22.8	-13.6	1969
1970	-31.2	-34.8	-28.4	-21.6	-10.7	3.6	9.4	7.6	0.1	-9.9	-23.1	-34.6	-14.3	1970
MEAN	-35.0	-34.3	-31.9	-22.8	-10.2	1.3	8.1	6.5	-1.0	-11.1	-23.4	-29.2	-15.2	MOYENNE
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

1964	-34.1	-31.0	-26.2	-18.9	-11.5	1.5	7.3	6.2	-1.9	-11.8	-21.0	-28.7	-18.0	1962
1965	-34.8	-34.9	-34.2	-25.6	-7.9	-0.3	6.5	7.2	-0.7	-12.3	-20.9	-29.7	-18.1	1963
1966	-33.4	-37.6	-29.7	-22.2	-9.8	0.3	7.2	5.6	-3.8	-13.0	-22.9	-31.4	-15.9	1964
1967	-38.3	-35.3	-29.3	-24.5	-6.0	3.4	9.3	7.7	1.2	-15.4	-26.6	-26.5	-15.9	1965
1968	-35.4	-36.9	-32.1	-24.0	-9.8	-1.6	6.5	5.2	-3.2	-8.3	-26.3	-26.8	-15.0	1966
1969	-35.1	-33.6	-27.9	-24.2	-11.2	2.6	6.3	5.6	1.1	-5.9	-21.3	-27.9	-16.1	1967
1970	-34.0	-29.8	-31.4	-19.8	-10.9	-2.0	9.1	7.4	1.1	-6.7	-23.8	-22.8	-14.3	1968
MEAN	-31.2	-34.8	-28.4	-21.6	-10.7	3.6	9.4	7.6	0.1	-9.9	-23.1	-34.6	-13.6	1969
	-35.0	-34.3	-31.4	-22.8	-10.2	1.3	8.1	6.5	-1.0	-11.1	-23.4	-29.2	-14.5	1970
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	-15.2 MOYENNE

ABLE 003 REF 101.00108.F01 BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
ABLEAU 003 REF 101.00108.F01 DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

MEAN DAILY TEMPERATURE (DEGREES CELSIUS)
TEMPERATURE QUOTIDIENNE MOYENNE (DEGRE CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1971	-31.3	-32.7	-29.1	-20.9	-9.6	3.5	9.2	6.1	1.0	-7.3	-25.6	-32.5	-14.1	1971
1972	-35.5	-38.8	-29.7	-26.7	-13.1	-1.7	5.9	4.4	-5.2	-16.3	-25.8	-31.7	-17.9	1972
1973	-32.3	-34.5	-33.7	-24.0	-6.8	5.0	8.8	9.5	1.6	-6.9	-20.6	-28.0	-13.5	1973
1974	-33.2	-35.8	-32.3	-26.3	-9.6	0.9	9.4	6.0	-3.3	-16.5	-22.0	-31.9	-16.2	1974
1975	-36.9	-32.3	-31.4	-16.1	-4.0	7.0	7.9	8.8	-1.1	-11.5	-22.6	-32.5	-13.7	1975
1976	-34.2	-34.5	-32.6	-16.4	-8.8	-0.2	8.3	5.0	-0.1	-11.8	-24.3	-32.7	-15.2	1976
1977	-29.7	-35.7	-30.6	-17.9	-7.4	3.3	8.3	6.1	1.6	-10.7	-23.8	-29.7	-13.9	1977
1978	-29.9	-27.3	-30.7	-23.3	-12.8	-2.7	4.5	3.4	-1.0	-19.2	-24.4	-27.9	-15.9	1978
1979	-30.1	-38.2	-33.7	-22.3	-8.2	-1.0	7.1	4.2	-1.9	-14.6	-18.6	-31.0	-16.7	1979
1980	-34.3	-26.8	-30.1	-23.2	-7.1	2.3	7.3	7.5	-2.0	-11.3	-27.7	-30.0	-14.6	1980
MEAN	-32.7	-33.7	-31.4	-21.7	-8.7	1.6	7.7	6.1	-1.0	-12.6	-23.5	-30.8	-15.1	MOYENNE

PERIOD OF RECORD/PERIODE DES RELEVES

AN	-33.2	-34.2	-30.5	-21.9	-9.5	1.7	8.2	6.7	-0.5	-11.5	-23.7	-30.1	-14.9	MOYENNE
D.DEV.	3.6	3.1	2.8	2.9	2.5	2.2	1.7	1.7	1.9	3.2	2.2	2.8	1.0	ECART-TYPE
OF YEARS	45	44	46	45	46	46	43	42	40	45	45	44		DUREE ANNEES
RCENTILES														PERCENTILES
95% <	-29.2	-27.8	-25.7	-16.2	-4.6	5.7	10.9	10.2	2.3	-6.3	-20.0	-24.8	-13.3	95%
75% <	-30.8	-32.2	-28.9	-20.5	-7.6	3.3	9.4	7.8	1.1	-9.4	-22.1	-28.6	-14.3	75%
50% <	-33.7	-34.9	-30.6	-22.2	-9.7	1.5	8.0	6.6	-0.3	-11.6	-23.8	-30.0	-15.1	50%
25% <	-35.9	-36.7	-32.4	-24.0	-11.1	-0.1	7.0	5.4	-2.0	-13.7	-25.5	-32.5	-15.9	25%
5% <	-38.3	-38.7	-35.8	-26.4	-13.5	-1.9	5.7	4.2	-3.8	-17.3	-27.6	-34.4	-16.9	5%

CODE 1 NORMALS/NORMALES 1951-80 CODE 1

N	-33.6	-34.4	-31.3	-21.9	-9.4	1.5	7.9	6.5	-0.7	-11.7	-23.8	-30.0	-15.1	MOYENNE
DEV.	2.5	3.1	2.4	3.1	2.7	2.4	1.3	1.7	1.9	3.3	2.2	3.1	1.0	ECART-TYPE
YEARS	30	30	30	30	30	30	30	30	30	30	30	30		DUREE ANNEES
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 085 REF 104.0009].F04 BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
TABLEAU 085 REF 104.0009].F04 DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

TOTAL DEGREE-DAYS BELOW 18.0 (DEGREES CELSIUS)
TOTAL DES DEGRES-JOURS AU-DESSOUS DE 18.0 (DEGRES CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1929	1457.3	1357.6	1568.1	1161.4	946.7	513.5	352.3	M	M	M	M	M	M	1929
1930	M	M	M	M	M	M	160.7	M	562.1	M	M	M	M	1930
MEAN	1457.3	1357.6	1568.1	1161.4	946.7	513.5	256.5	M	562.1	M	M	M	M	MOYENNE
1931	M	M	M	M	875.7	404.9	M	388.6	487.5	816.9	M	M	M	1931
MISSING 1932-33 MANQUANT														
1934	M	M	M	M	M	M	M	M	M	968.3	1161.2	M	M	1934
1935	M	M	1521.4	1200.5	889.7	444.4	248.7	291.1	552.2	M	M	1547.0	M	1935
1936	1742.7	1621.1	1559.0	1255.9	924.9	518.3	M	M	M	1103.3	1316.1	1595.7	M	1936
1937	1553.0	1482.8	1467.8	1165.6	847.6	M	282.9	M	M	844.5	1217.4	1573.7	M	1937
1938	M	M	M	1064.7	794.8	M	M	M	M	M	M	1467.5	M	1938
MISSING 1939 MANQUANT														
1940	1291.6	1379.1	1356.9	1040.6	750.5	M	310.2	M	472.0	867.6	1258.5	M	M	1940
MEAN	1529.1	1494.3	1476.3	1145.5	847.2	455.9	280.6	339.9	503.9	920.1	1238.3	1546.0	11777.1	MOYENNE
1941	1569.6	1322.3	1503.0	1257.5	854.1	442.4	231.6	386.8	636.3	927.3	1370.1	M	M	1941
1942	1474.0	1526.7	M	M	M	492.7	234.8	350.6	M	M	1299.1	1480.9	M	1942
1943	1603.4	1403.0	1426.1	M	M	455.7	M	M	M	808.6	1132.0	1458.9	M	1943
1944	1491.3	1506.2	1465.0	M	M	451.9	335.0	361.8	544.7	870.3	1170.9	1352.2	M	1944
1945	M	1386.0	1362.6	M	889.5	M	M	M	M	863.1	M	M	M	1945
1946	M	M	1349.9	1147.0	M	517.4	326.3	331.2	623.4	1024.0	1241.9	M	M	1946
1947	1622.8	M	1343.8	1196.7	900.4	M	M	M	M	M	M	M	M	1947
1948	M	1533.1	1545.5	1267.3	793.5	460.6	218.5	301.9	510.7	898.1	1214.1	1605.4	M	1948
1949	1602.5	1568.0	1469.3	1183.7	923.1	573.5	381.7	302.8	508.2	934.7	1205.4	1440.4	12093.3	1949
1950	1770.2	1490.6	1383.1	1234.9	884.1	535.3	362.9	408.3	531.7	1036.0	1277.7	1459.2	12374.0	1950
MEAN	1590.5	1467.0	1427.6	1214.5	874.1	491.2	298.7	349.1	559.2	920.3	1238.9	1466.2	11897.3	MOYENNE
1951	1514.5	1545.8	1536.5	1211.0	789.0	474.2	340.6	330.8	549.4	917.7	1283.7	1600.1	12093.3	1951
1952	1661.2	1555.6	1528.9	1044.4	666.3	437.3	308.1	400.1	597.7	970.3	1250.7	1337.6	11758.2	1952
1953	1694.1	1360.8	1499.8	1017.0	886.9	503.8	320.3	327.5	527.9	933.5	1183.8	M	M	1953
1954	1603.7	1432.2	1455.9	1284.9	860.0	519.3	264.7	215.2	454.3	909.7	1212.4	1548.5	11760.8	1954
1955	1529.0	1573.3	1571.2	1114.8	840.0	486.8	315.2	369.3	550.4	785.5	1269.3	1526.7	11913.5	1955
1956	1506.1	1555.6	1570.1	1201.0	990.2	505.6	268.6	390.9	607.7	993.0	1275.1	1569.6	12433.5	1956
1957	1633.8	1514.9	1423.7	1177.7	931.5	542.6	351.8	360.8	520.6	847.9	1344.0	1630.4	12279.7	1957
1958	1528.0	1603.3	1490.7	1317.5	796.9	533.6	315.8	284.9	492.3	838.0	1363.0	1453.0	12017.0	1958
1959	1497.3	1413.5	1537.7	1175.1	982.1	556.9	366.5	406.2	553.9	1003.3	1240.9	1324.3	12057.7	1959
1960	1636.1	1511.5	1593.4	1225.1	736.0	363.0	274.5	313.4	550.4	862.3	1303.5	1371.3	11747.6	1960
MEAN	1580.4	1506.7	1520.8	1176.9	847.9	492.3	312.6	337.9	540.5	906.8	1272.6	1484.8	11980.2	MOYENNE
1961	1649.5	1414.6	1727.1	1256.8	903.2	496.0	254.0	400.0	651.3	1050.0	1229.4	1605.6	12637.8	1961
1962	1625.4	1530.6	1382.9	1229.0	958.3	423.6	265.9	344.5	530.9	925.1	1291.7	1483.7	11991.6	1962
1963	1632.7	1371.2	1679.7	1106.2	915.6	497.7	332.7	365.1	596.0	923.0	1170.6	1447.6	12036.1	1963
1964	1736.9	1535.1	1616.6	1306.1	802.6	547.2	358.3	336.8	559.3	937.3	1167.6	1479.4	12385.2	1964
1965	1594.3	1556.4	1478.1	1206.5	863.3	531.2	332.8	385.5	654.7	962.0	1227.2	1529.4	12321.4	1965
1966	1745.9	1491.7	1465.2	1273.7	743.5	438.9	267.5	319.9	503.5	1033.5	1337.7	1380.6	12001.6	1966
1967	1654.4	1536.6	1552.5	1259.1	863.9	588.3	355.1	398.2	635.2	815.0	1329.5	1387.8	12378.6	1967
1968	1645.9	1496.2	1421.6	1265.0	907.2	461.3	361.5	384.8	506.2	742.3	1180.8	1422.9	11795.7	1968
1969	1612.4	1338.8	1531.0	1136.0	896.2	598.6	276.3	328.0	505.9	765.7	1253.7	1263.8	11906.0	1969
1970	1524.2	1476.6	1439.3	1188.4	889.8	432.4	267.1	353.2	538.3	864.6	1233.2	1428.4	11885.5	1970
MEAN	1642.2	1474.8	1529.4	1222.9	874.4	501.5	307.1	358.6	560.1	901.8	1242.1	1462.9	12085.8	MOYENNE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
	JAN	FEV	MARS	AVR	MAI	JUIN	JUIL	AOUT	SEPT	OCT	NOV	DEC	ANNUELLE

1966	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.	385	651	96	12	[illegible]	96.
1967	1689.4	1636.6	1662.8	1259.1	863.9	588.3	355.1	328.2	635.2	815.0	1329.5	387.8	2378.6	1967
1968	1845.9	1496.2	1421.6	1265.0	907.2	461.3	361.5	384.8	506.2	742.3	1180.8	422.9	1795.7	1968
1969	1612.4	1338.8	1531.0	1136.0	696.2	598.6	276.3	328.0	505.9	765.2	1253.7	263.8	1506.0	1969
1970	1624.2	1476.6	1439.3	1188.4	889.8	432.4	267.1	323.2	538.3	869.6	1233.2	628.4	1805.5	1970
MEAN	1642.2	1474.8	1529.4	1222.9	874.4	501.5	307.1	358.6	568.1	901.8	1242.1	1462.9	12085.8	MOYENNE
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 085
TABLEAU 085

REF 104.0009|.G04
REF 104.0009|.G04

BEGAN JAN 1929 2500600 CAMBRIDGE BAY A NWT
DEBUT JAN 1929 2500600 CAMBRIDGE BAY A TN-O

TOTAL DEGREE-DAYS BELOW 18.0 (DEGREES CELSIUS)
TOTAL DES DEGRES-JOURS AU-DESSOUS DE 18.0 (DEGRES CELSIUS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	
1971	1526.7	1419.2	1460.0	1167.3	856.3	434.7	270.6	367.2	509.6	784.5	1302.1	1566.3	11671.5	1971
1972	1656.0	1646.1	1480.3	1342.0	965.1	591.5	373.3	422.9	696.3	1063.7	1312.0	1538.8	13088.0	1972
1973	1557.6	1470.8	1603.8	1258.9	768.8	390.3	283.6	262.7	492.5	769.7	1160.0	1427.4	11446.1	1973
1974	1588.7	1504.8	1560.3	1330.0	855.2	512.5	266.8	373.7	639.3	1070.1	1202.2	1547.9	12451.5	1974
1975	1701.1	1407.1	1531.7	1021.4	680.6	329.6	313.7	286.0	571.7	914.1	1216.7	1567.1	12540.8	1975
1976	1617.1	1520.6	1568.7	1030.7	831.1	544.8	300.3	402.2	540.6	921.7	1269.4	1569.3	12116.5	1976
1977	1478.1	1504.5	1507.2	1076.9	787.5	440.5	301.8	370.0	493.8	889.5	1255.5	1479.3	11584.6	1977
1978	1484.0	1268.9	1509.3	1240.2	955.8	621.8	417.8	453.7	568.3	1152.9	1271.3	1423.8	12367.0	1978
1979	1491.9	1574.0	1601.3	1210.1	811.5	570.1	337.7	427.1	597.4	1012.0	1098.8	1520.6	12252.5	1979
1980	1620.2	1298.9	1491.0	1236.2	778.0	471.4	331.9	325.0	599.7	906.6	1370.1	1487.5	11916.5	1980
MEAN	1572.1	1461.5	1531.4	1191.4	829.0	490.7	319.8	369.1	570.9	948.5	1246.5	1512.8	12043.7	MOYENNE

PERIOD OF RECORD/PERIODE DES RELEVES

MEAN	1588.4	1476.3	1503.1	1192.5	855.5	491.8	305.7	353.3	535.6	919.4	1249.5	1489.8	11980.9	MOYENNE
STD.DEV.	94.8	90.7	84.6	86.9	77.4	64.9	51.1	49.9	56.6	97.0	66.0	91.1	366.8	ECART-TYPE
# OF YEARS	41	42	44	42	43	42	42	39	40	43	42	39		DUREE ANNEES
MONTHLY HIGH	1770.2	1646.1	1727.1	1342.0	990.2	621.8	417.8	453.7	696.3	1152.9	1370.1	1630.4	13088.0	MAX. MENSUEL
MONTHLY LOW	1291.6	1268.9	1343.8	1017.0	666.3	329.6	160.7	215.2	454.3	742.3	1098.8	1263.8	11995.1	MIN. MENSUEL
PERCENTILES														PERCENTILES
25% <	1745.6	1618.4	1663.9	1328.1	978.7	597.5	380.4	427.1	654.5	1096.7	1369.0	1628.4	12817.7	25%
75% >	1647.7	1538.9	1560.0	1257.9	907.2	537.1	343.4	390.9	597.6	993.0	1300.2	1567.1	12367.8	75%
50% <	1603.4	1500.4	1505.1	1203.8	863.3	496.9	312.0	360.8	549.9	917.7	1252.2	1483.7	12038.1	50%
25% <	1519.4	1406.1	1456.9	1144.3	794.8	441.9	287.4	323.2	508.6	847.9	1204.6	1427.4	11760.8	25%
5% >	1459.0	1302.4	1351.7	1022.8	691.7	367.1	220.5	262.7	472.8	766.2	1136.2	1324.3	11482.0	5%

MEAN	1598.2	1481.0	1527.2	1197.0	850.4	494.9	313.2	355.2	559.8	919.0	1253.8	1486.9	12036.6	MOYENNE
STD.DEV.	76.2	90.9	75.9	92.8	84.9	70.9	41.5	52.3	57.8	101.2	65.4	95.7	374.7	ECART-TYPE
# OF YEARS	30	30	30	30	30	30	30	30	30	30	30	29		DUREE ANNEES
	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEPT	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	

TABLE 123 REF 102.00156.F02 BEGAN APR 1955 2500600 CAMBRIDGE BAY A NWT
TABLEAU 123 REF 102.00156.F02 DEBUT AVR 1955 2500600 CAMBRIDGE BAY A TN-O

MEAN WIND SPEED IN KILOMETRES PER HOUR (16 POINTS)
VITESSE MOYENNE DU VENT EN KILOMETRES PAR HEURE (16 DIRECTIONS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEP	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1955	M	M	M	19.9	22.2	22.9	22.5	22.4	22.1	19.3	19.6	17.4	M	1955
1956	22.1	20.1	17.1	23.3	20.1	22.8	17.8	23.9	25.8	23.5	19.8	15.6	21.0	1956
1957	22.0	14.8	18.5	18.6	18.6	21.4	21.0	22.6	22.7	25.5	18.2	16.5	20.1	1957
1958	19.1	12.5	16.9	16.6	23.6	22.0	22.2	18.8	18.8	25.9	17.9	17.9	19.1	1958
1959	27.6	21.4	13.4	17.1	15.8	23.8	19.7	20.5	23.9	22.4	19.3	18.5	20.3	1959
1960	16.1	17.4	15.8	20.7	22.6	18.9	25.0	22.5	24.6	23.1	20.9	26.1	21.2	1960
MEAN	21.4	17.2	16.2	19.4	20.5	22.0	21.4	21.9	22.7	23.3	19.1	18.6	20.3	MOYENNE
1961	25.3	27.9	17.2	21.5	22.0	19.7	17.4	25.4	18.9	19.7	18.5	20.0	21.1	1961
1962	24.3	21.8	20.9	20.7	17.3	16.5	19.2	19.2	21.9	22.2	19.1	22.2	20.6	1962
1963	29.2	25.7	17.0	19.5	17.2	23.5	19.6	18.2	19.5	20.3	12.1	17.8	19.9	1963
1964	14.0	17.8	20.1	17.7	14.9	21.9	14.5	17.9	18.7	20.8	23.2	21.0	18.5	1964
1965	21.1	20.1	18.8	15.6	20.9	16.2	17.3	13.6	18.8	20.0	17.6	11.6	17.5	1965
1966	18.4	14.8	16.6	16.1	20.7	18.5	16.6	17.9	20.0	21.0	19.2	14.8	17.9	1966
1967	15.0	19.6	23.2	18.0	22.0	18.2	18.7	20.9	22.8	23.4	14.0	18.3	19.5	1967
1968	16.5	20.3	22.2	17.2	18.4	17.5	23.4	22.6	27.7	23.3	26.2	21.3	21.4	1968
1969	18.7	17.0	20.3	22.0	22.4	24.1	20.9	20.4	23.4	27.5	24.2	18.1	21.6	1969
1970	22.5	24.6	20.2	21.4	20.1	23.0	21.5	24.4	30.4	24.5	23.4	21.2	23.1	1970
MEAN	20.5	21.0	19.9	19.0	19.5	19.7	18.9	20.1	22.2	22.3	19.8	18.7	20.1	MOYENNE
1971	30.2	18.2	20.0	24.9	21.8	22.1	23.4	27.2	25.2	28.0	22.8	20.7	23.7	1971
1972	25.8	22.5	21.2	20.4	21.7	23.4	22.3	23.6	27.2	25.9	24.2	21.3	24.3	1972
1973	22.8	25.8	22.4	18.6	24.9	23.1	21.4	25.1	25.5	26.0	19.3	22.1	23.1	1973
1974	27.5	21.2	24.0	22.9	21.6	24.5	24.8	24.4	34.4	31.5	21.3	19.4	24.8	1974
1975	29.3	26.3	23.8	19.7	24.7	22.3	25.9	22.0	28.8	28.0	28.9	28.2	25.7	1975
1976	26.3	30.8	25.8	25.3	27.0	23.4	20.2	20.6	20.2	26.8	26.6	26.9	26.3	1976
1977	32.2	21.8	26.9	27.0	32.7	27.4	23.5	28.3	23.9	27.3	29.7	29.2	27.5	1977
1978	32.9	21.3	24.2	22.2	22.8	25.7	23.2	22.1	21.6	22.7	24.7	18.3	23.5	1978
1979	23.5	23.3	29.0	21.7	24.1	21.9	24.2	25.3	21.9	19.6	23.7	24.9	23.6	1979
1980	25.5	22.8	18.4	23.6	22.2	22.3	17.6	22.1	18.7	14.8	22.3	27.0	21.4	1980
MEAN	27.6	23.4	23.6	22.6	24.4	23.6	22.7	24.9	25.5	25.1	24.4	23.8	24.3	MOYENNE
PERIOD OF RECORD/PERIODE DES RELEVES														
MEAN	23.5	21.2	20.6	20.5	21.6	21.7	20.9	22.3	23.6	23.6	21.4	20.6	21.7	MOYENNE
STD.DEV.	5.3	4.3	3.7	3.0	3.6	2.9	2.9	3.5	4.2	3.6	4.2	4.4	2.6	ECART-TYPE
# OF YEARS	25	25	25	26	26	26	26	26	26	26	26	26		DUREE ANNEES
PERCENTILES														PERCENTILES
95% <	32.7	29.9	28.4	26.4	30.7	26.8	25.6	28.5	33.0	30.3	29.4	28.9	27.1	95%
75% <	27.6	24.0	23.6	22.4	23.0	23.4	23.4	24.6	26.2	26.2	24.2	22.9	23.6	75%
50% <	23.5	21.3	20.2	20.6	21.9	22.3	21.2	22.5	23.1	23.4	21.1	20.4	21.4	50%
25% <	18.9	18.0	17.8	17.9	19.7	19.5	18.5	20.1	19.8	20.7	19.0	17.7	20.0	25%
5% <	14.3	13.2	14.1	15.8	15.2	16.3	15.2	15.1	17.5	16.4	12.8	12.7	17.6	5%
	CODE 2					NORMALS/NORMALES 1955-80						CODE 2		
MEAN	23.5	21.2	20.6	20.5	21.6	21.7	20.9	22.3	23.6	23.6	21.4	20.6	21.7	MOYENNE
STD.DEV.	5.3	4.3	3.7	3.0	3.6	2.9	2.9	3.5	4.2	3.6	4.2	4.4	2.6	ECART-TYPE
# OF YEARS	25	25	25	26	26	26	26	26	26	26	26	26		DUREE ANNEES
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
	JAN	FEV	MARS	AVR	MAI	JUIN	JUIL	AOUT	SEP	OCT	NOV	DEC	ANNUELLE	

TABLE 124 REF 102.00156.E04 BEGAN APR 1955 2500600 CAMBRIDGE BAY A NWT
TABLEAU 124 REF 102.00156.E04 DEBUT AVR 1955 2500600 CAMBRIDGE BAY A TN-O

PREVAILING WIND DIRECTION (16 POINTS)
DIRECTION DE VENT DOMINANT (16 DIRECTIONS)

YEAR	JAN JAN	FEB FEV	MAR MARS	APR AVR	MAY MAI	JUN JUIN	JUL JUIL	AUG AOUT	SEP SEP	OCT OCT	NOV NOV	DEC DEC	ANNUAL ANNUELLE	ANNEE
1955	M	M	M	E	E	E	W	NW	NW	NE	NW	W	M	1955
1956	W	W	W	SE	NW	SE	SE	NE	NW	NW	W	W	W	1956
1957	NW	W	NE	W	NW	NNE	NNE	W	NW	NW	NW	NW	NW	1957
1958	NW	W	NE	NW	NW	W	NW	E	E	NW	NE	NW	NW	1958
1959	NW	NW	WNW	NE	NNW	NNE	WNW	W	NNW	NW	WNW	WNW	NW	1959
1960	NW	NW	NW	NE	E	E	SE	SE	E	NW	NW	NW	NW	1960
PREVAILING	NW	W	W	NW	NW	E	SE	W	NW	NW	NW	NW	NW	DOMINANTE
1961	W	W	W	W	W	E	W	NNW	N	NW	NW	W	W	1961
1962	NW	NW	NE	NW	W	NNE	NNE	W	NW	E	NW	NW	NW	1962
1963	NW	NW	NW	WNE	NW	SE	SE	NW	NW	SE	NW	NW	NW	1963
1964	W	NW	W	NE	NW	NW	W	SE	N	NE	NW	NW	NW	1964
1965	NW	W	NW	NE	NW	E	W	W	N	NW	NW	W	NW	1965
1966	W	NE	NE	W	SE	W	NE	W	N	N	NW	W	W	1966
1967	NW	W	W	W	NW	N	W	W	N	SE	NW	NW	W	1967
1968	NE	W	N	NE	NW	N	N	N	NE	NE	NE	NW	NE	1968
1969	NE	W	NW	NE	NNW	N	S	SE	W	S	W	ENE	W	1969
1970	W	NW	NW	NE	NW	W	NE	E	SE	NE	NW	W	NW	1970
PREVAILING	NW	NW	NW	NE	NW	N	W	W	N	NW	NW	NW	NE	DOMINANTE
1971	NNE	E	NNE	NE	NNW	N	NNE	W	NW	E	NW	W	NE	1971
1972	W	W	W	NE	E	E	N	N	N	NW	W	W	W	1972
1973	W	NW	W	NE	E	NE	W	SE	N	NW	NW	NW	W	1973
1974	NW	NE	W	W	NE	E	W	N	N	NE	NE	W	W	1974
1975	W	NNW	NW	NE	W	SSE	W	W	WNW	N	NW	W	W	1975
1976	NW	NW	W	NE	E	W	NE	W	N	SSE	NW	W	NW	1976
1977	NW	NE	NE	W	ESE	N	N	N	W	N	NW	W	N	1977
1978	NW	NE	NW	W	W	N	N	W	S	NW	W	NE	NW	1978
1979	W	W	NW	NE	NNE	N	N	N	N	NW	NW	W	W	1979
1980	NW	NW	NW	E	E	NNW	W	NNE	NNW	ESE	NW	NW	NW	1980
PREVAILING	NW	NW	NW	NE	E	N	W	W	N	NW	NW	W	NW	DOMINANTE

PERIOD OF RECORD/PERIODE DES RELEVES

# OF YEARS	25	25	25	26	26	26	26	26	26	26	26	26		DUREE ANNEES
PREVAILING DIRECTIONS														DIRECTIONS DOMINANTES
FIRST	NW	W	NW	NE	NW	W	W	W	N	NW	NW	W	NW	PREMIERE
SECOND	W	NW	W	W	E	E	NNE	W	NW	NE	W	NW	W	DEUXIEME
THIRD	NNW	WNW	NE	NW	SE	NE	N	SE	NNW	E	NE	WNW	NE	TROISIEME
FOURTH	WNW	NE	WNW	E	NNW	SE	NE	NW	NE	N	NNW	NE	N	QUATRIEME
FIFTH	N	NNW	NNW	ENE	W	NW	WSW	NNW	E	NNW	N	N	NNW	CINQUIEME

CODE 2 NORMALS/NORMALES 1955-80 CODE 2

PREVAILING	NW	W	NW	NE	NW	W	W	W	N	NW	NW	W	NW	DOMINANTE
# OF YEARS	25	25	25	26	26	26	26	26	26	26	26	26		DUREE ANNEES
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
	JAN	FEV	MARS	AVR	MAI	JUIN	JUIL	AOUT	SEP	OCT	NOV	DEC	ANNUELLE	

Energy, Mines and Resources Canada | Energie, Mines et Ressources Canada

Northwest Territories Public Works

Arctic Hotel Retrofit and Addition

Post-Project Summary

Canada/Northwest Territories Conservation and Renewable Energy Demonstration Program

Project Location:
Cambridge Bay, N.W.T.

Date:
December 1983

Technology:
Efficient retrofit, insulation

Project Manager:
Canadian Arctic Co-operative Federation Limited
Box 2039
Yellowknife, N.W.T.
Ph. (403) 873-3481

Project No:
H3.3.12

Sector:
Commercial

Status:
Complete

Province:
Northwest Territories

Purpose:
To demonstrate the effectiveness of retrofitting and expanding an existing commercial structure using energy conservation techniques.

Description:
Styrofoam insulation (R.10) overlaid with Thermar building siding (R.5) covered the 30 foot by 120 foot structure. All windows were replaced with triple glazed units. The second floor addition with 2 inch by 3 inch and 2 inch by 6 inch staggered double walls provided R.40 insulation with the vapour barrier on the inside of the 10 inch wall. Fiberglass batt insulation (6 inch - R.20) was retrofitted to the underside of the sub floor of the original building. A heat exchanger was installed in the second storey meeting room.

Contributors:

N.W.T./Canada Program	$22,000.00
Ikaluktutiak Co-operative Ltd.	23,169.00
	$45,169.00

Demonstrated Benefits and Savings:
A savings of 40 percent (24,454 liters or $17,386.79 based on May 1983 prices) was realized in heating oil deliveries during the 12 months ending April 1983, when compared to the projected fuel consumption without the benefit of energy enhancement measures. Benefit is known to have been derived by the Government of the Northwest Territories and the Arctic Co-operative Limited, as both plan to or have adopted similar conservation measures to combat the high energy costs in Cambridge Bay and other arctic communities.

Further Information:
An evaluation report of the success of the project will be available by April, 1984.

Information Contact:

Canadian Arctic Co-operative Federation Limited
Boe 2039
Yellowknife, N.W.T.
Ph. (403) 873-3481

or

Energy Conservation Division
Department of Public Works
Government of the Northwest Territories
Yellowknife, N.W.T. X1A 2L9
Ph. (403) 873-7203

Project Name:
Arctic Hotel Retrofit and Addition

Financial Analysis:
Capital costs of energy conservation features

Hotel addition		$ 6,204.00
Labour		3,000.00
Retrofit		18,465.00
Labour		7,500.00
Information transfer		10,000.00
		$45,169.00
Payback period	$35,169 / $17,387	2.0 Years

Monitoring and Evaluation:
Monitoring took the form of recording the fuel consumption for a period of one year after the completion of the project.

Technical Details and Specifications:
Heat exchanger: model - Van EE R-200: 110 volts, 24 amps

Site Photograph: